A Landscape Perspective on Fire and Weeds in the Pacific

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UH Manoa

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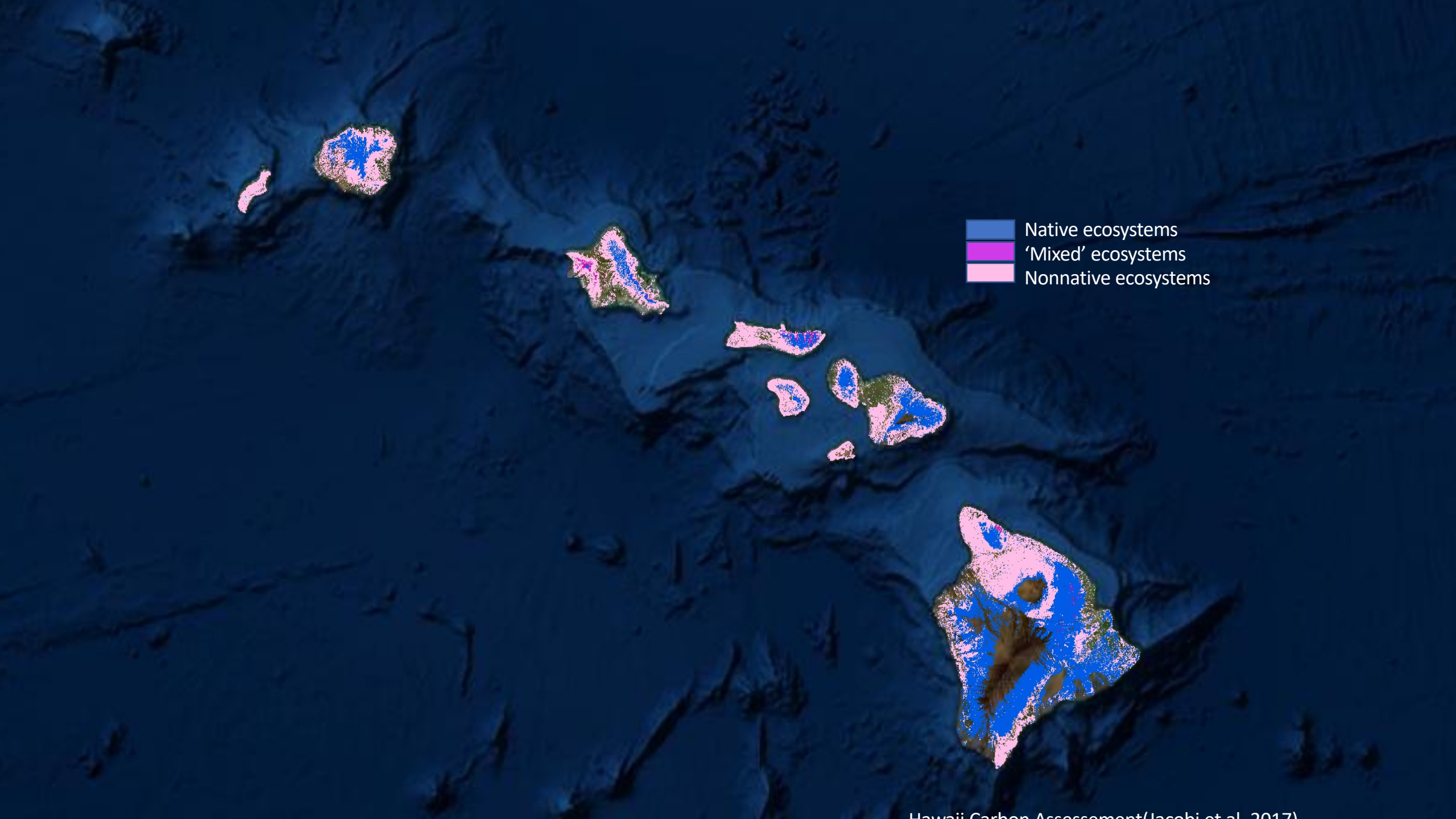
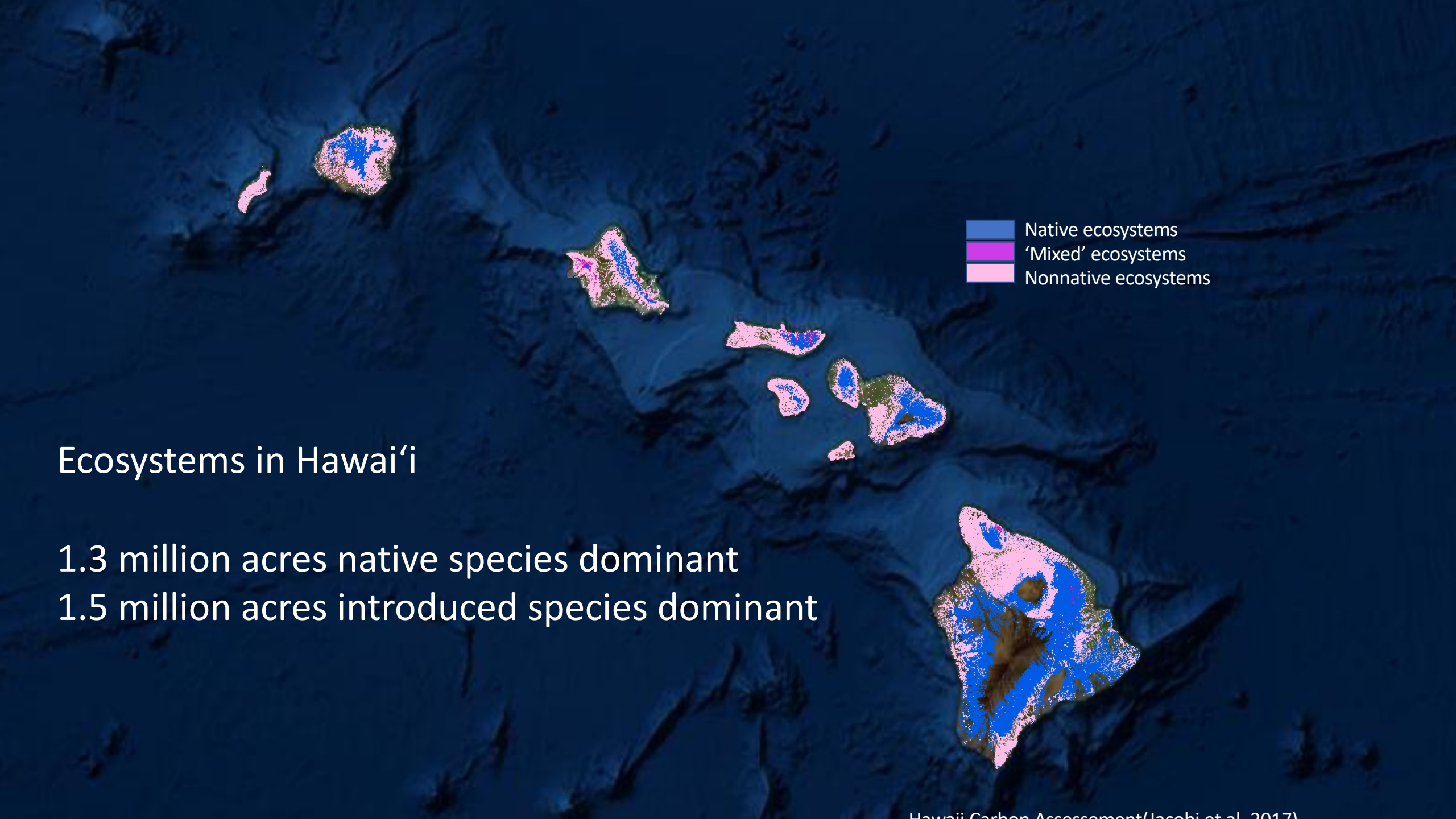


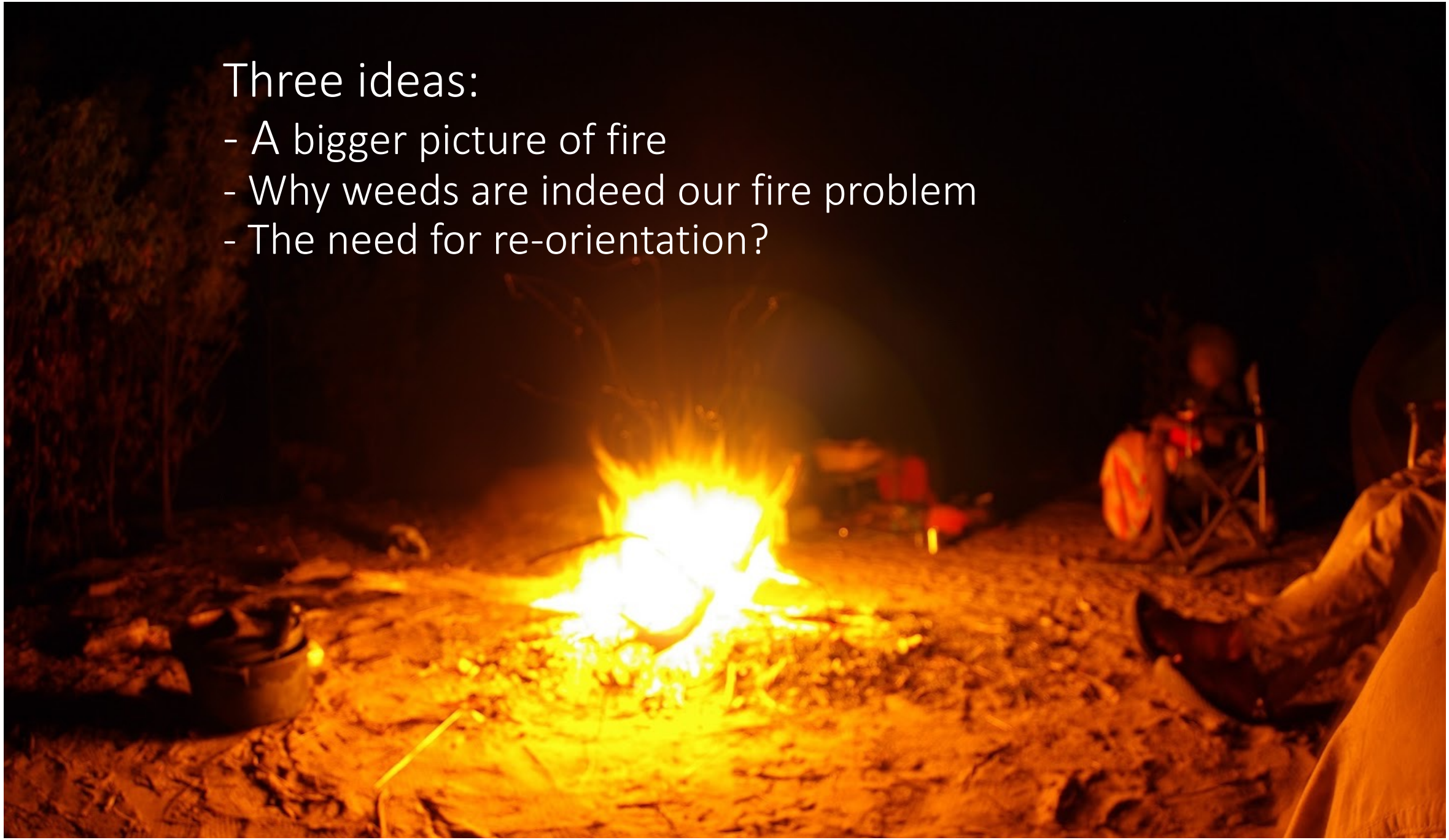
Hawaii Carbon Assessment(Jacobi et al. 2017)



Ecosystems in Hawai‘i

1.3 million acres native species dominant
1.5 million acres introduced species dominant

Hawaii Carbon Assessment(Jacobi et al. 2017)


Three ideas:
- A bigger picture of fire
- Why weeds are indeed our fire problem
- The need for re-orientation?


Mākaha Valley
Mākaha
Wai'anae
2018 West Oahu Fires

Hawaii's Big Burn - 1901 Hamakua Fire

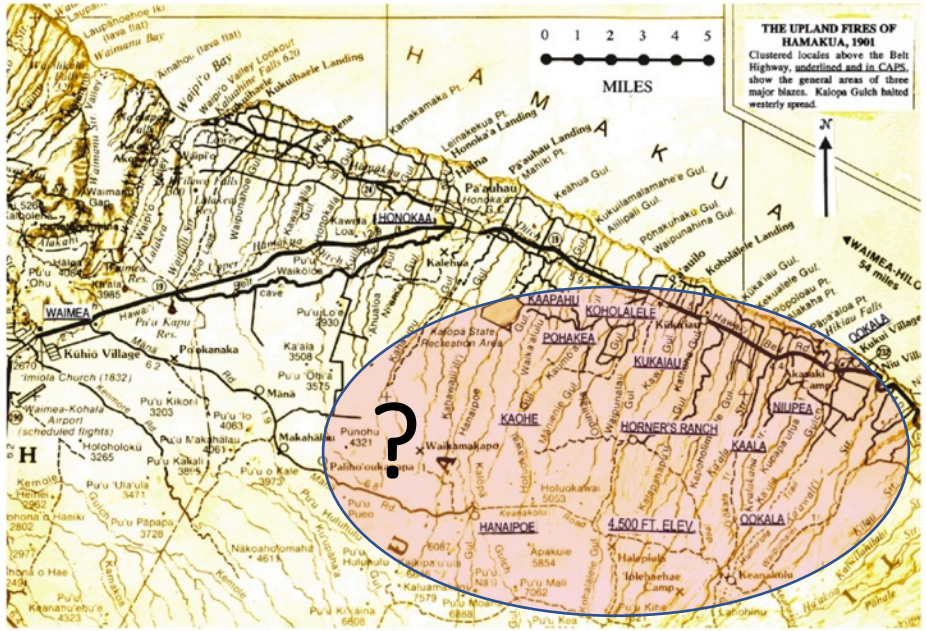
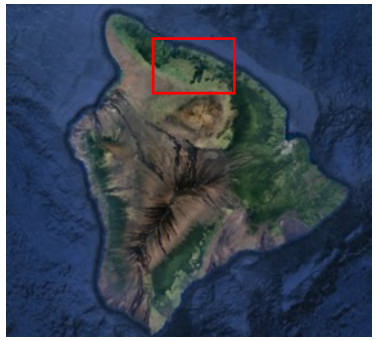


Figure 1. *A general map showing sites, areas and localities all above the Belt Highway (underlined) where the 1901 fires occurred. This can give only a vague indication of the extent of damaged lands. Few actual boundaries are known. Overlay on J. Biers map, U.H. Press, Honolulu.*

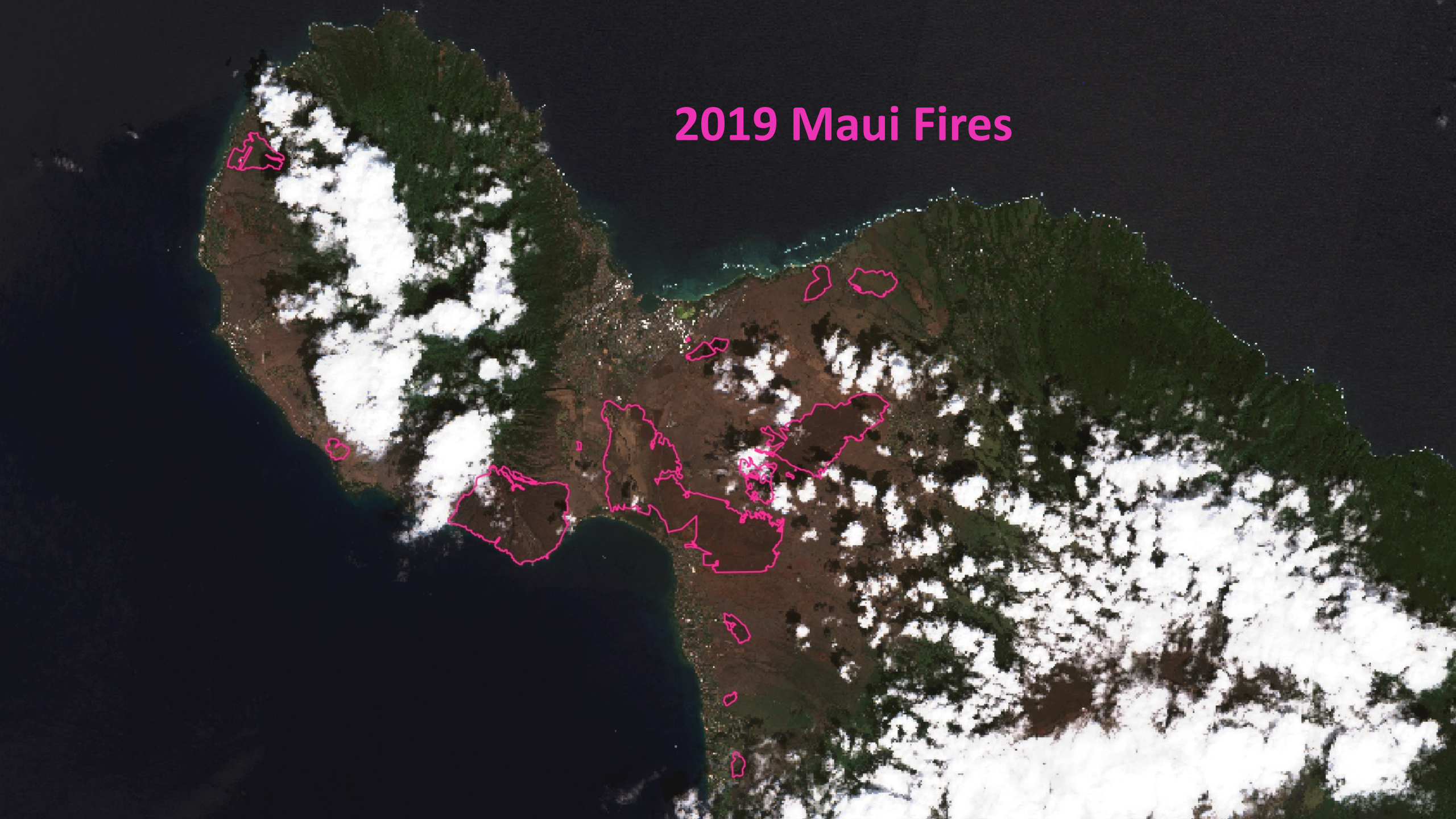


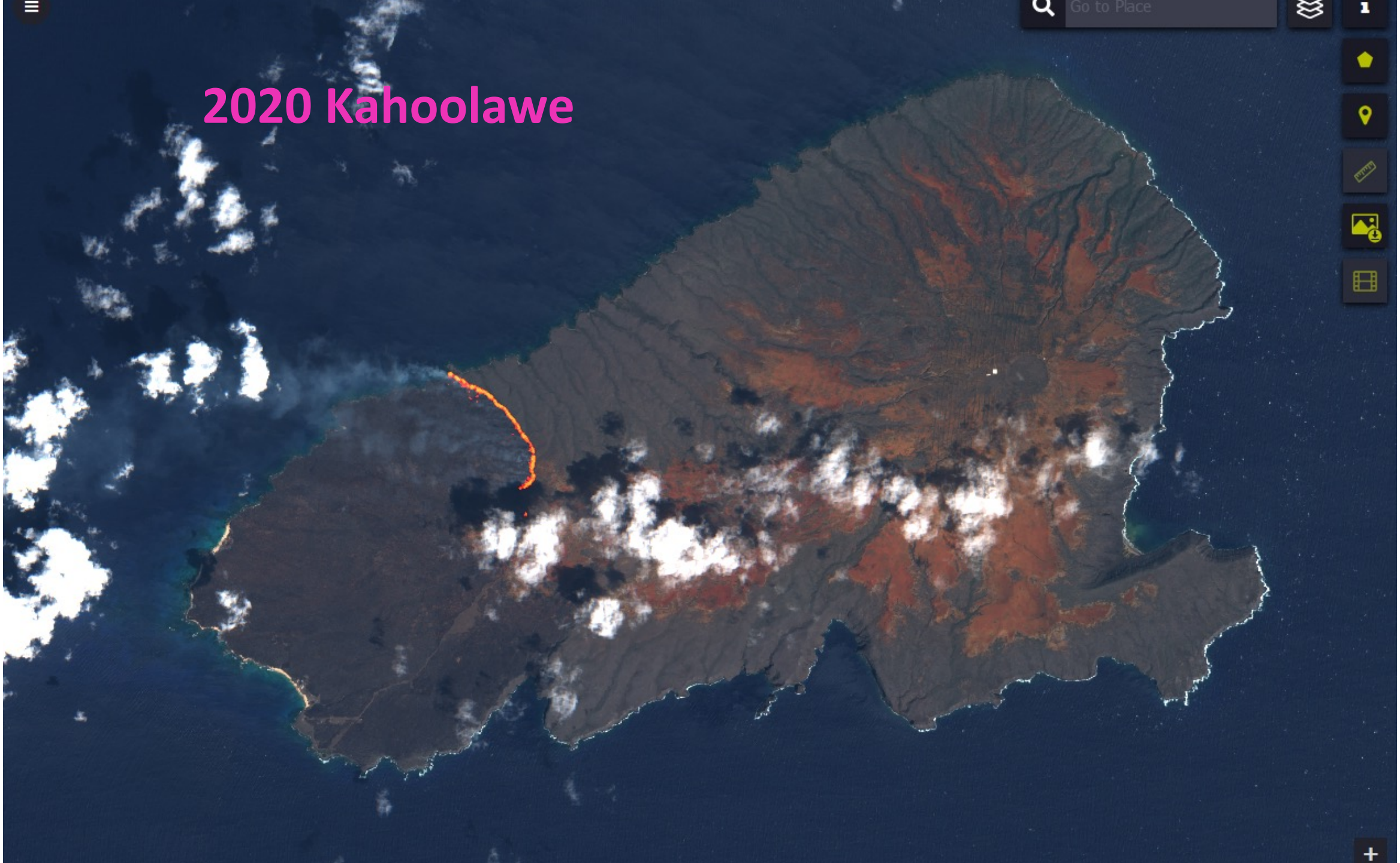
Values at Risk:

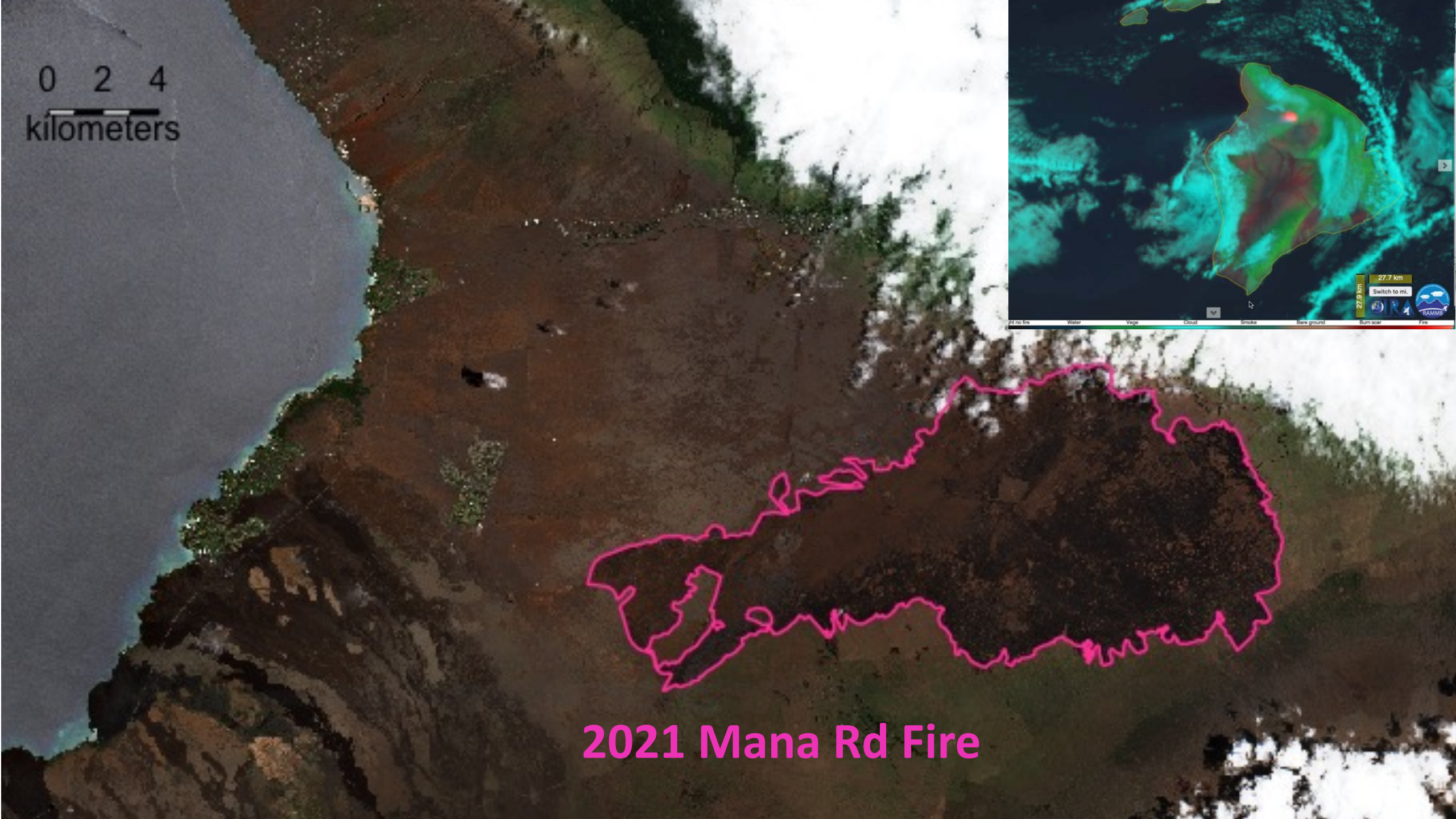
"the whole problem is conserving the water supply which depends on the preservation of the existing forests and restocking some of the denuded slopes…"

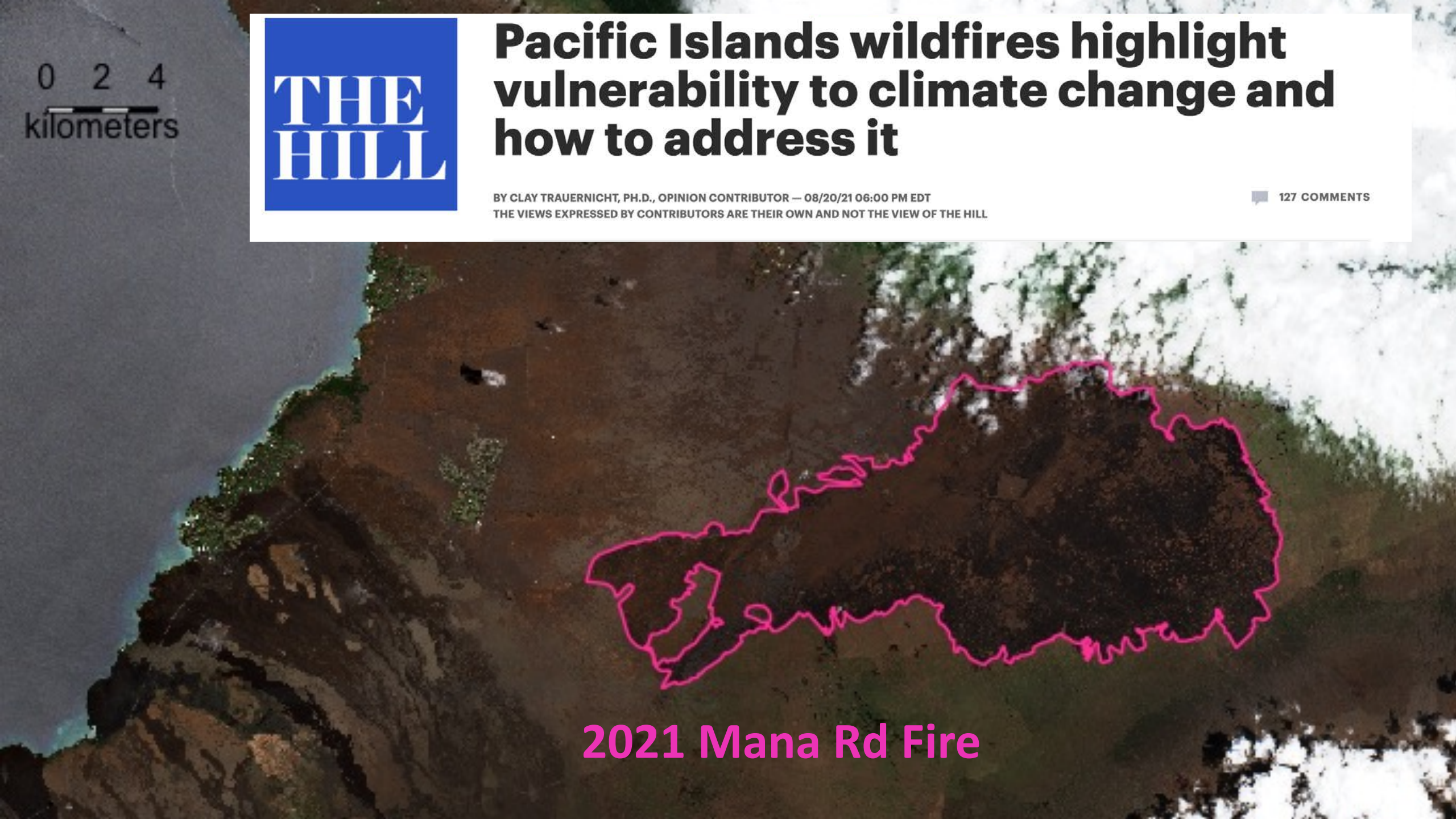
- Edward Griffiths, US Bureau of Forestry, 1902

Burned for 3 months, affected 30,000 acres


2019 Maui Fires


2020 Kahoolawe
Go to Place


0 2 4
kilometers
2021 Mana Rd Fire



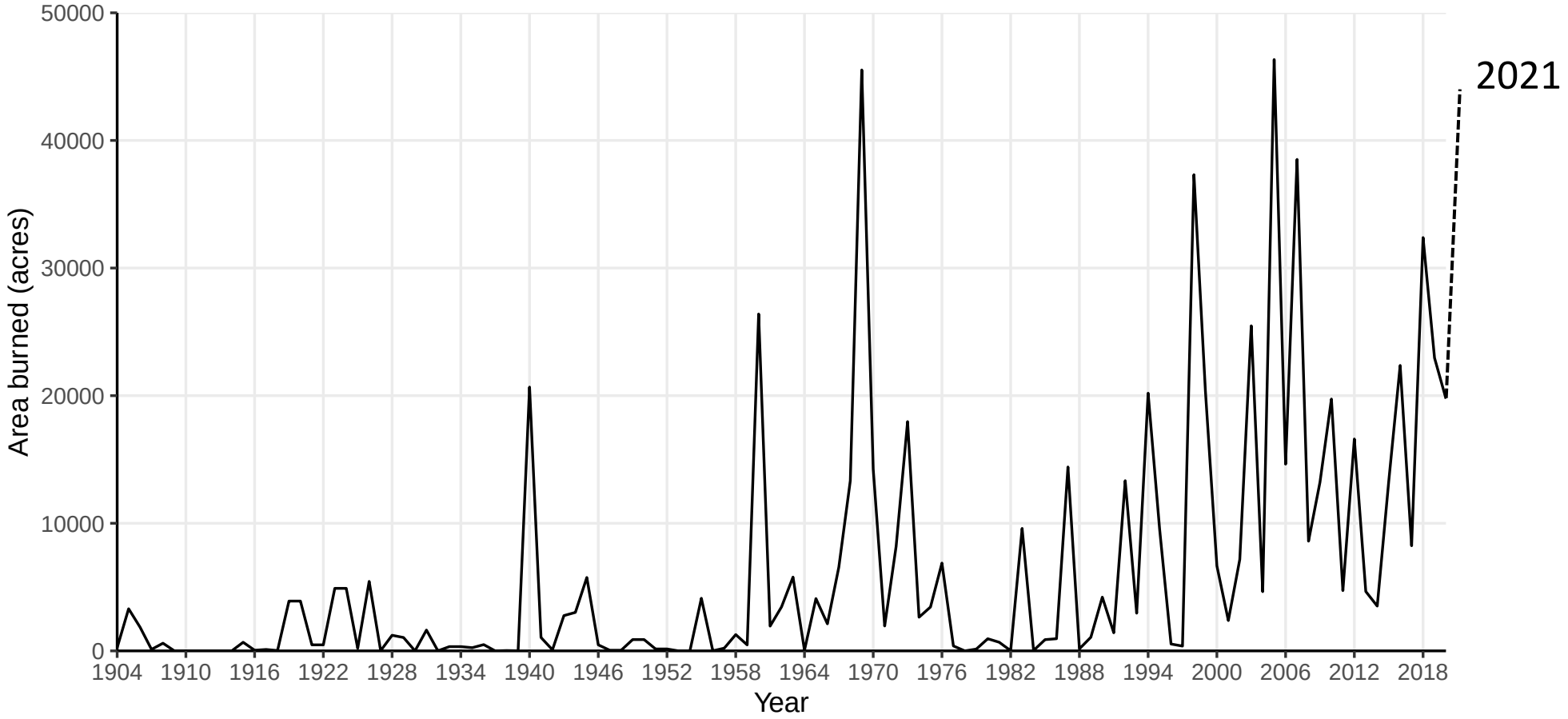
THE HILL

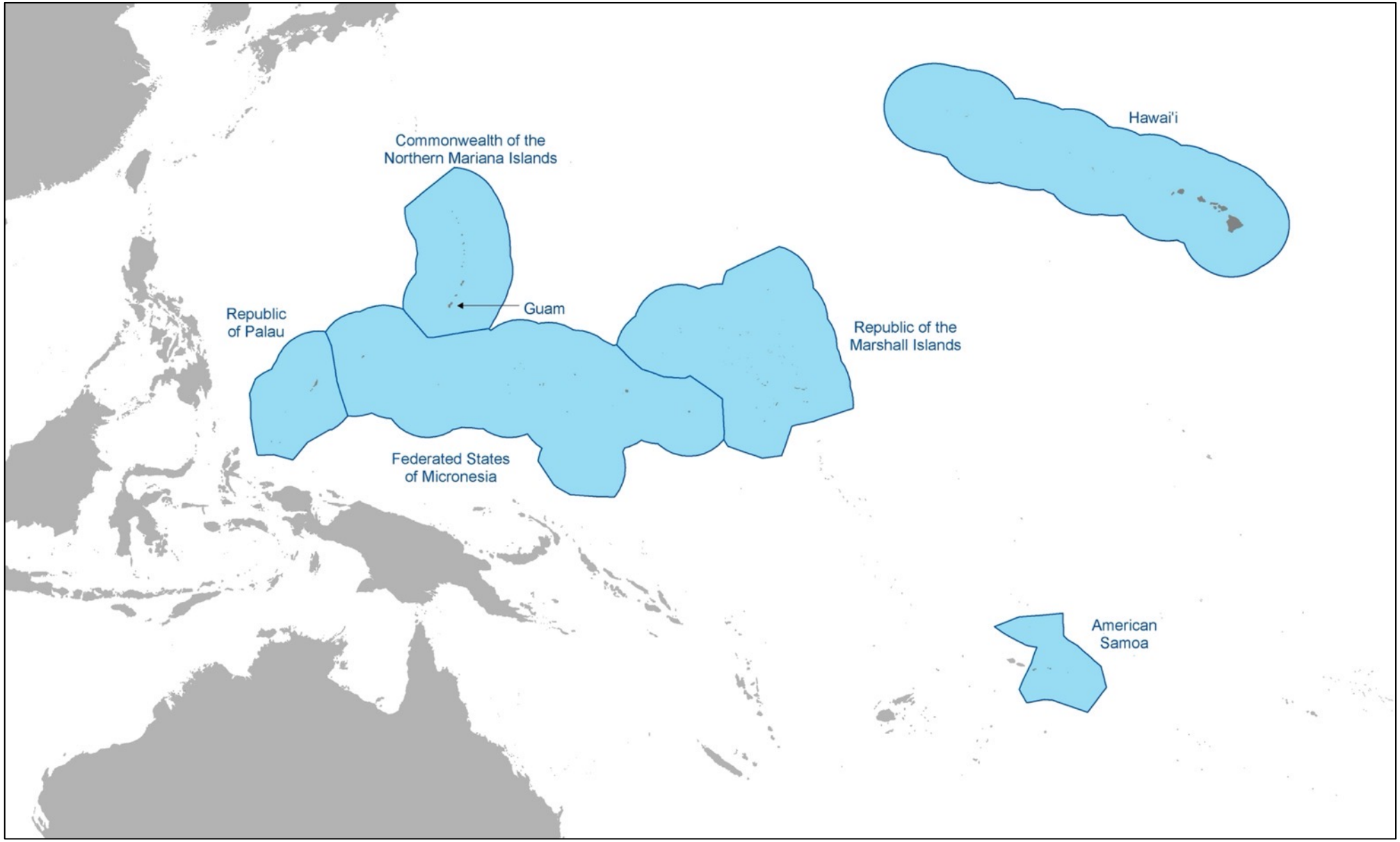
Pacific Islands wildfires highlight vulnerability to climate change and how to address it

BY CLAY TRAUERNICHT, PH.D., OPINION CONTRIBUTOR — 08/20/21 06:00 PM EDT
THE VIEWS EXPRESSED BY CONTRIBUTORS ARE THEIR OWN AND NOT THE VIEW OF THE HILL

127 COMMENTS

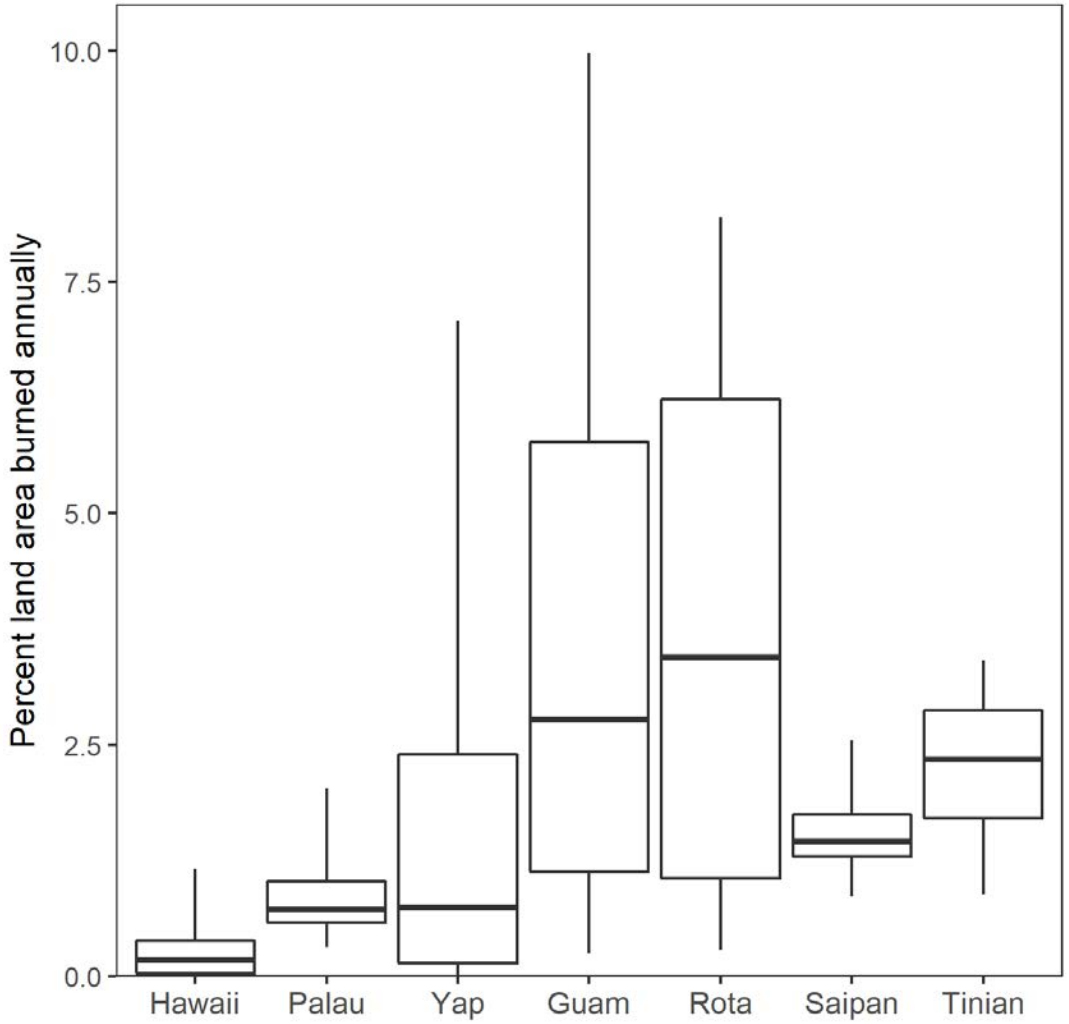
Annual area burned in Hawai‘i 1904-2021



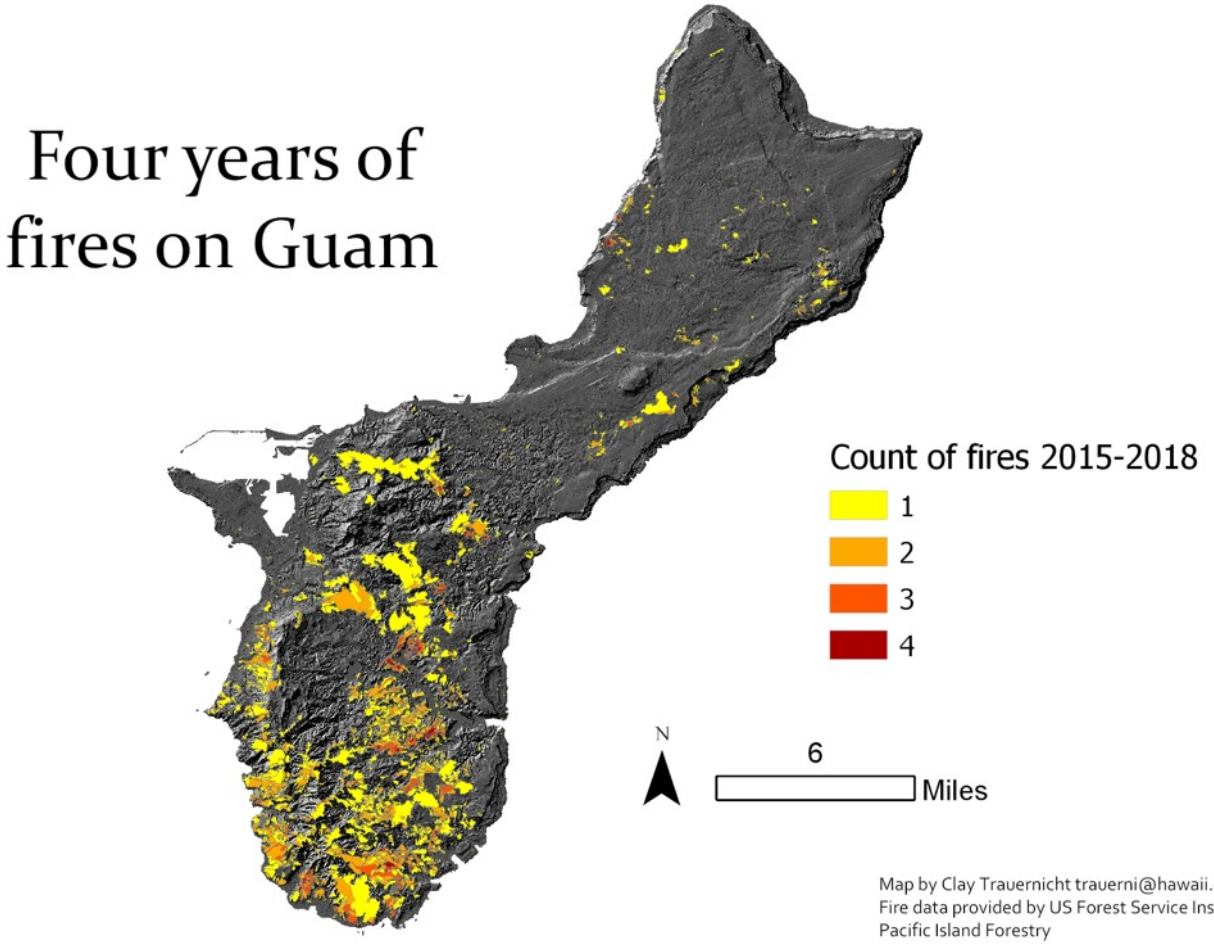


www.pacificrisa.org

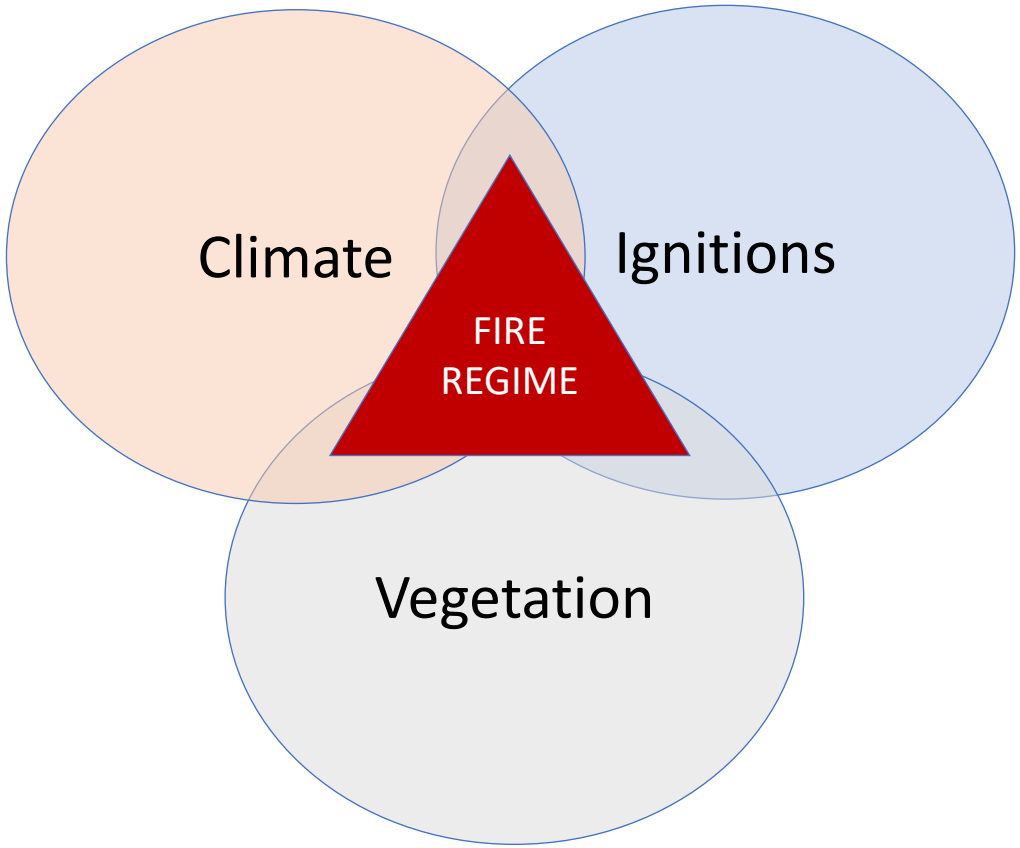
Fire in the Pacific Islands



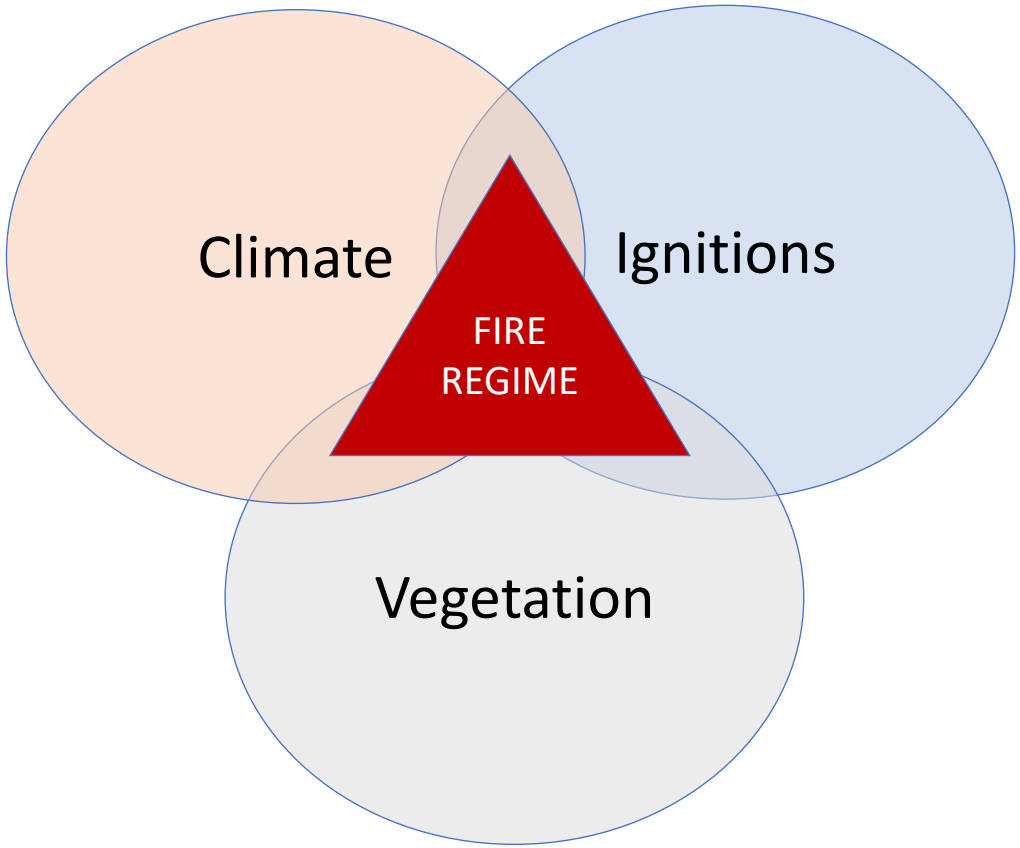
Pacific Fire Exchange



Changing fire regimes on Pacific Islands

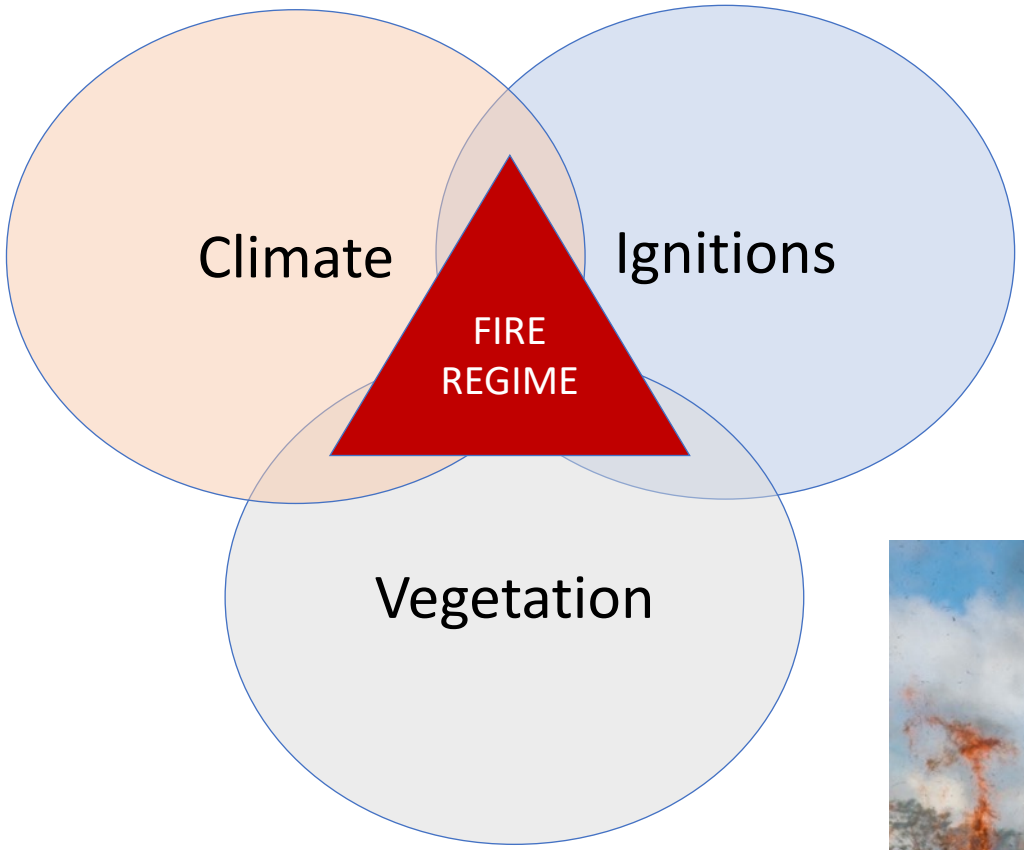


Changing fire regimes on Pacific Islands



Human-caused ignitions

Changing fire regimes on Pacific Islands

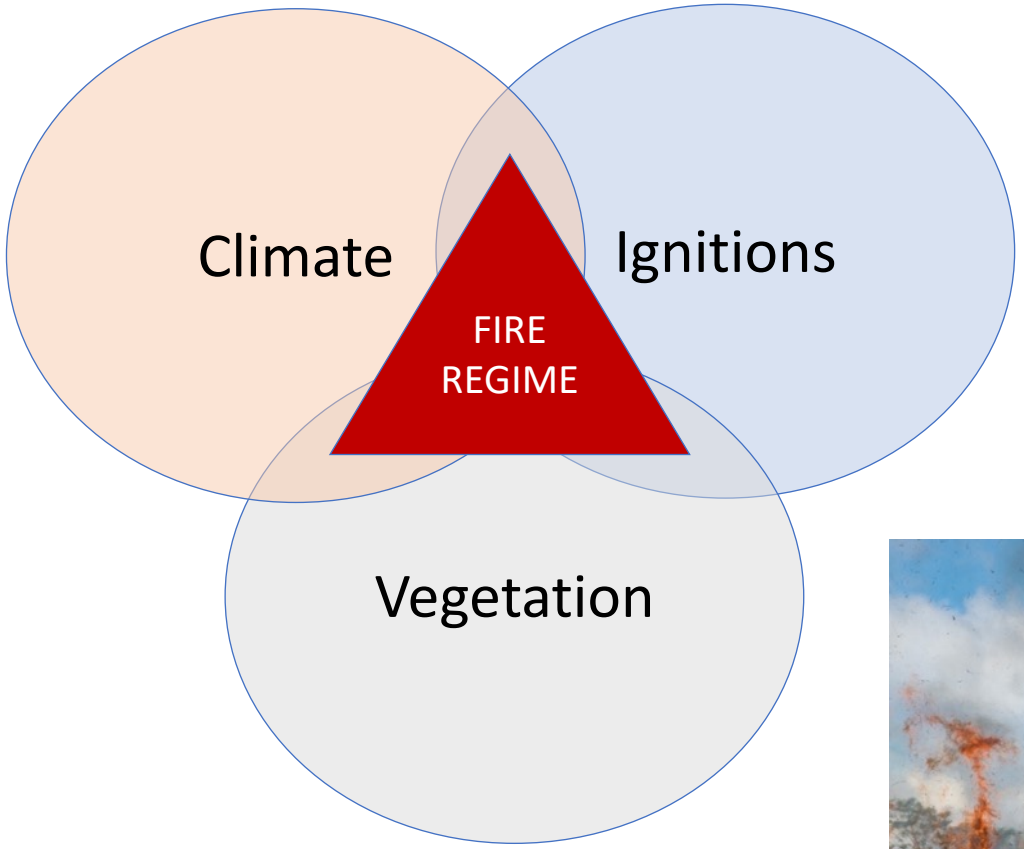


Grassland/savanna expansion

Human-caused ignitions

Changing fire regimes on Pacific Islands

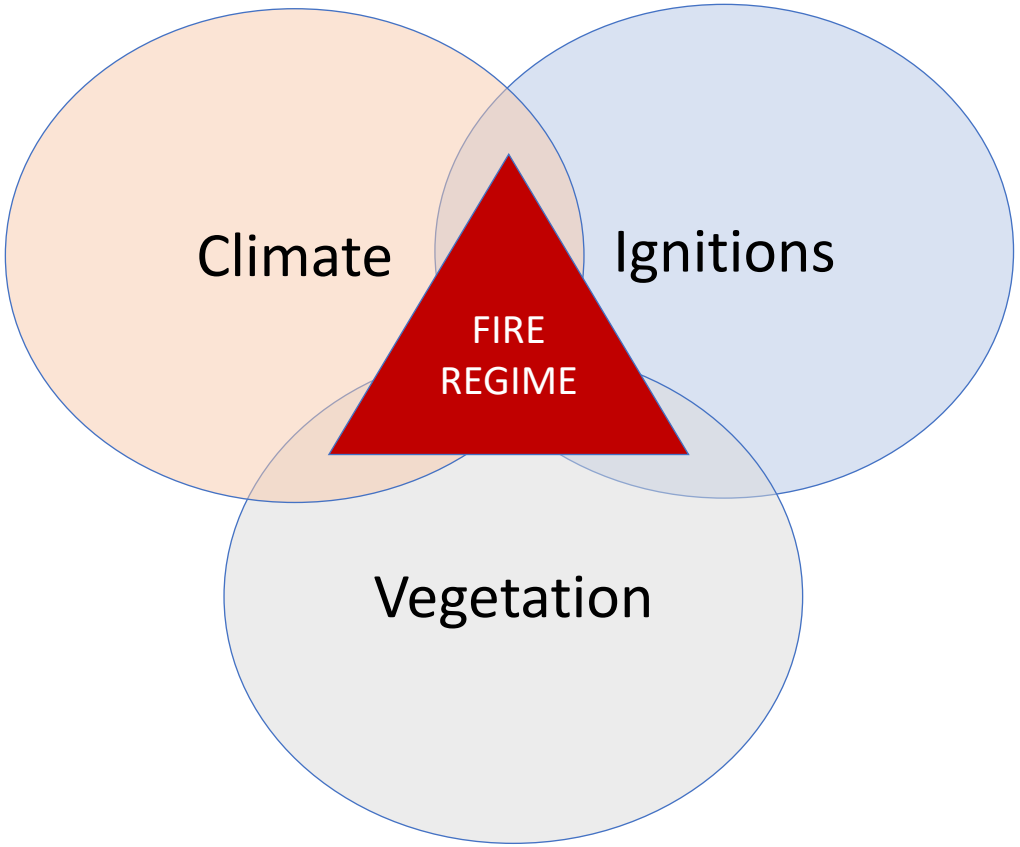
Heavy rainfall and drought



Grassland/savanna expansion

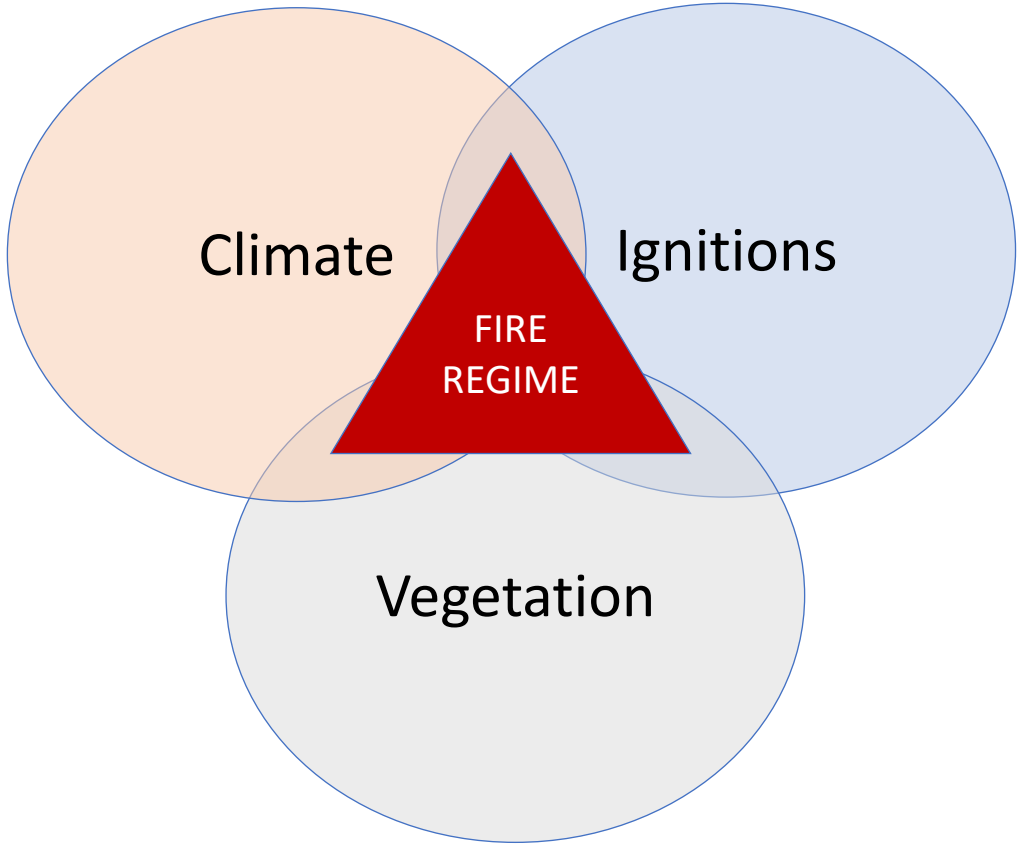
Human-caused ignitions

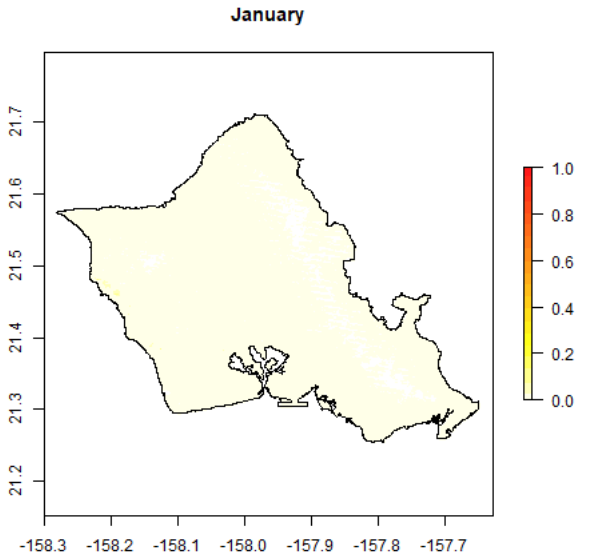
Why we care…



Mauna Kea 33 Fire 2010. Photo: Jay Hatayama

How we intervene…





‘Cohesive Strategy for Wildland Fire Management’

Fire-specific knowledge

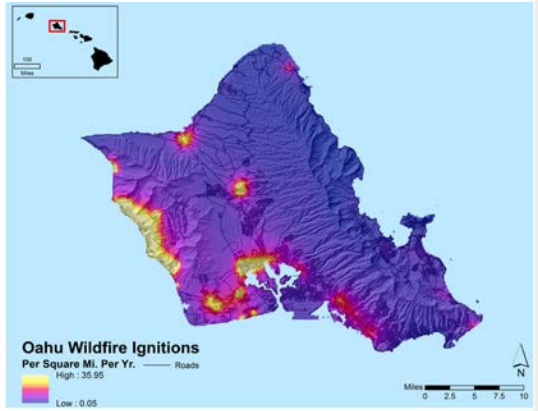
Local knowledge

FIRE RESILIENT LANDSCAPES

FIRE-ADAPTED COMMUNITIES

PFX
Pacific Fire Exchange

www.PacificFireExchange.org
@PacificFireSci



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Forest and Natural Reseource Management
Febrary 2016
RM-20

Pre-Fire Planning Guide for Resource Managers and Landowners in Hawai'i and Pacific Islands

College of Tropical Agriculture and Human Resources
University of Hawai'i at Mānoa

Forestry and Natural Resources Management
December 2019
RM-22

Fuel Breaks and Fuels-Management Strategies for Pacific Island Grasslands and Savannas

Clay Trauernicht[1] and Melissa Kunz[2]
[1]Department of Natural Resources and Environmental Management;
[2]Hawai'i Wildfire Management Organization, Kamuela, HI

Grazing to Reduce Blazing

Pacific Fire Exchange

PFX Fact Sheet | April 2016

JOINT FIRE SCIENCE PROGRAM

Wildfire in the Western Pacific

Pacific Fire Exchange

PFX Fact Sheet | February 2017

JOINT FIRE SCIENCE PROGRAM

2018 Wildfires in Hawai`i | PFX Annual Summary

Wildfire Review Series

Abandoned Agriculture in 2019 is Hawai'i's Fire Problem

communicating fire knowledge across the Pacific

In Hawai'i, the land area in active agriculture has declined by 60% since the 1960s causing

PFX FACT SHEET

Pacific Fire Exchange | Climate Change Series | April 2021 | JOINT FIRE SCIENCE PROGRAM

Changing Climate and Wildfire: a Crisis Brewing in the Pacific

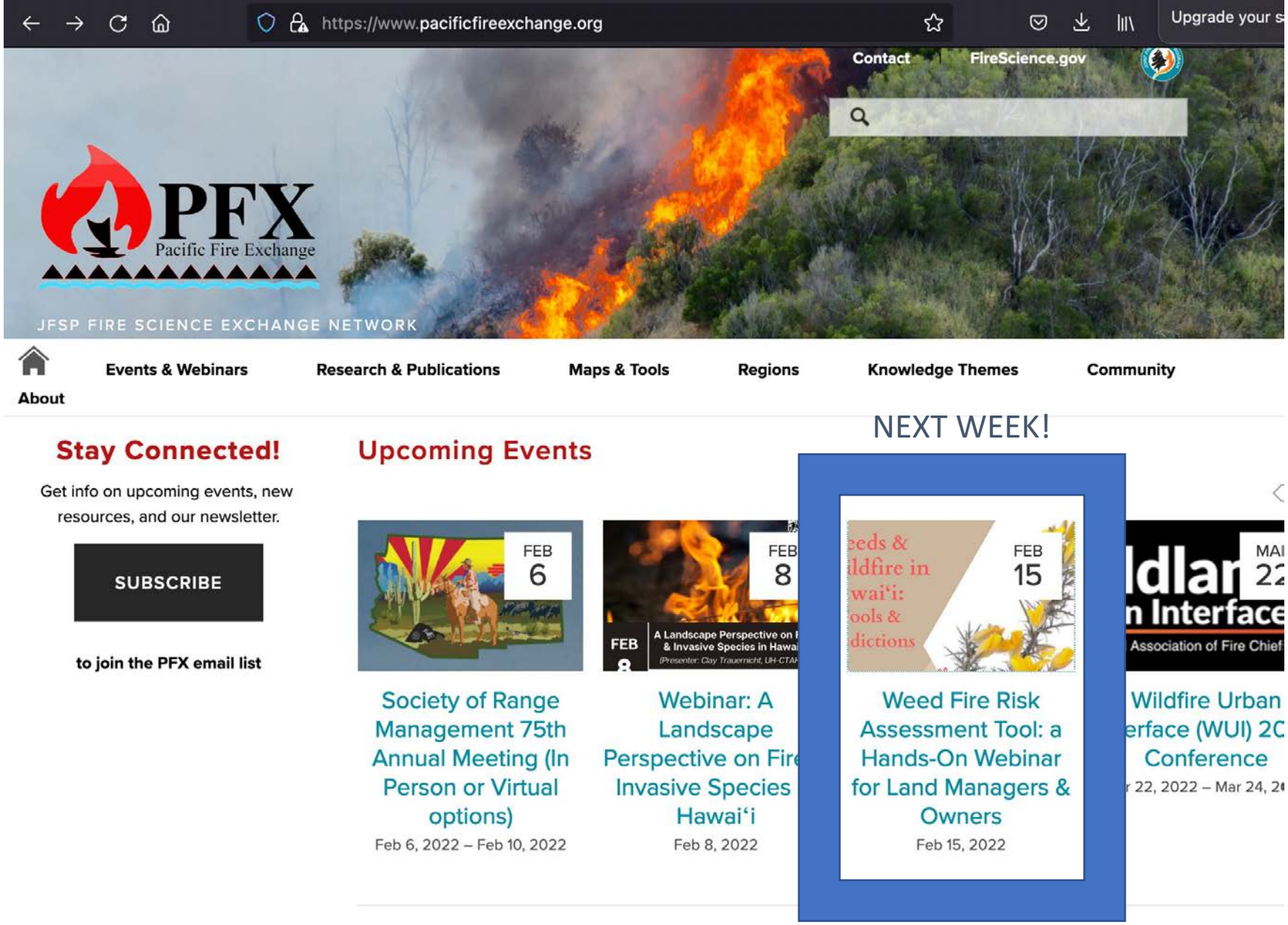
As the climate crisis rages on, wildfires will become ever more frequent, more intense, and more wide-spreading in Hawai'i and across the Pacific. The most affected areas will be grasslands and savannas which surround residential areas and the edges of watershed forests.

Did You Know?

Becoming wildfire-ready and wildfire-resilient are key climate adaptation strategies.

On our current trajectory, increasing temperatures

- Wildfire risk in Hawai'i and around the Pacific is due to vast areas of highly flammable grasslands and shrublands (10–25% of island land area) and human-caused ignitions (up to 99% of all fires).
- Warming air and changing rainfall patterns from climate change will increase our wildfire risk.
- Heavier rainfall increases grass growth and makes more fuels, which, followed by more intense droughts increases the likelihood and intensity of fires.



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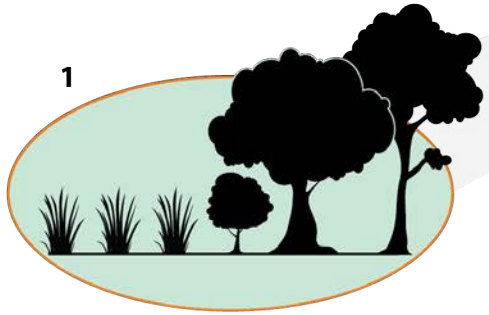
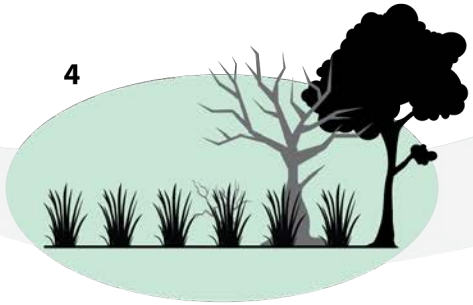
The Grass-Fire Cycle on Pacific Islands

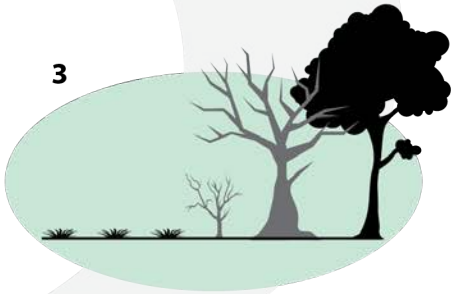


Recurrent fires reduce the size of remnant forests, further increasing the area of grasslands[1].

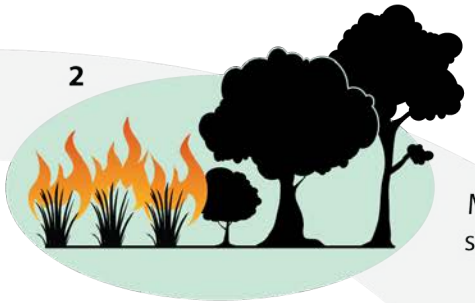
The spread of grasses increases the likelihood and size of future fires.



Grasses are able to seed and re-sprout shortly after fire, taking up light, water, and space. This competition for resources limits the ability of native plants to establish and may cause areas to become "stuck" in a grassland state[2].



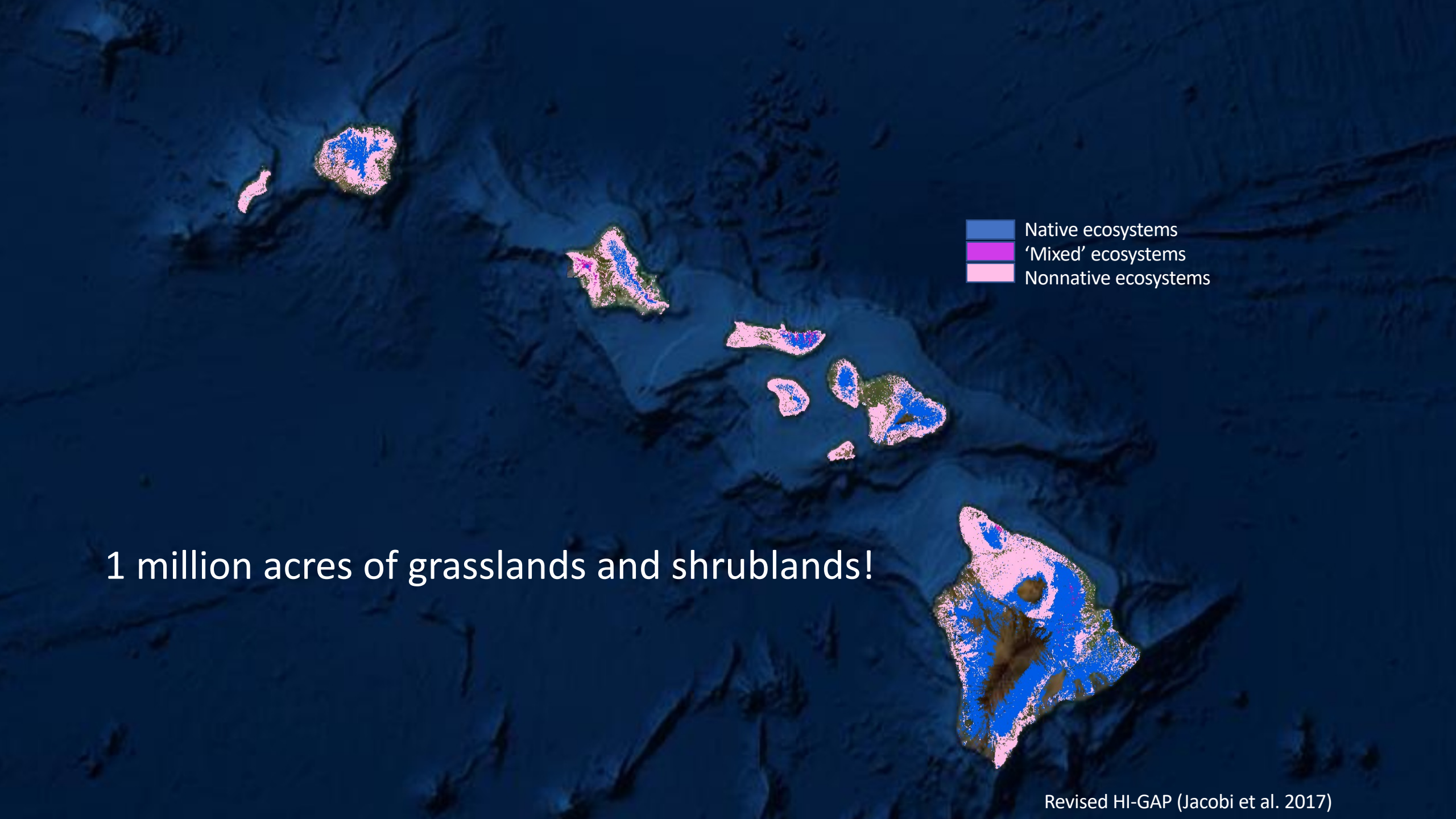
Many native trees and shrubs of Pacific Island forests are killed by repeated fires[4]. The negative impacts of even one single high-intensity fire can last for decades[5].



Grasses can carry fire from grass-dominated areas into forested and woodland areas[3], as well as to communities where people live.

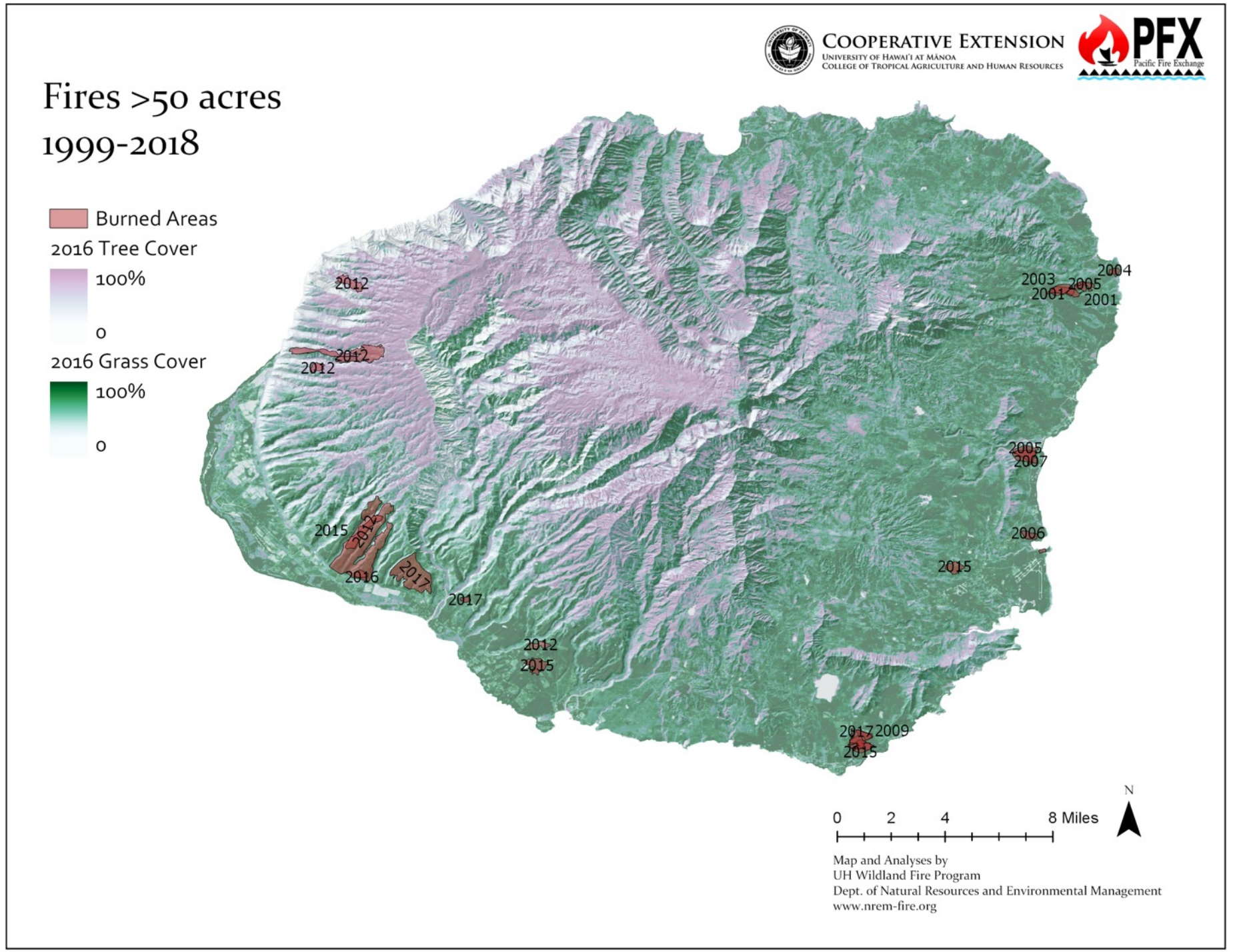
www.PacificFireExchange.org/research-publications

PFX
Pacific Fire Exchange



1 million acres of grasslands and shrublands!

Revised HI-GAP (Jacobi et al. 2017)


Cooperative Extension
University of Hawai'i at Mānoa
College of Tropical Agriculture and Human Resources
PFX
Pacific Fire Exchange
Fires >50 acres
1999-2018
Burned Areas
2016 Tree Cover
100%
0
2016 Grass Cover
100%
0
2012
2012
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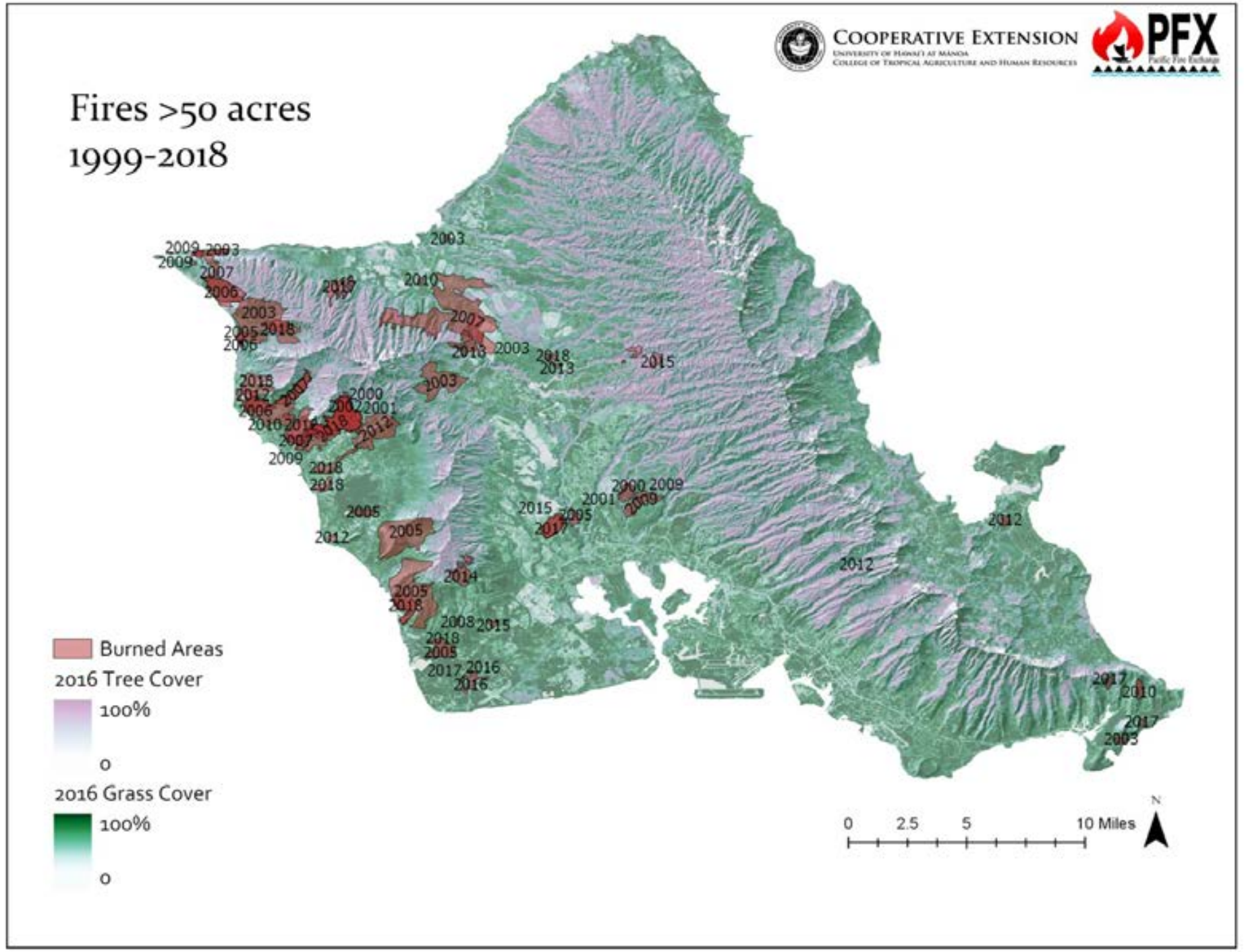
0 2 4 8 Miles
N
Map and Analyses by
UH Wildland Fire Program
Dept. of Natural Resources and Environmental Management
www.nrem-fire.org


Cooperative Extension
University of Hawai'i at Manoa
College of Tropical Agriculture and Human Resources
PFX
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Fires >50 acres
1999-2018
Burned Areas
2016 Tree Cover
100%
0
2016 Grass Cover
100%
0
0 2.5 5 10 Miles
N

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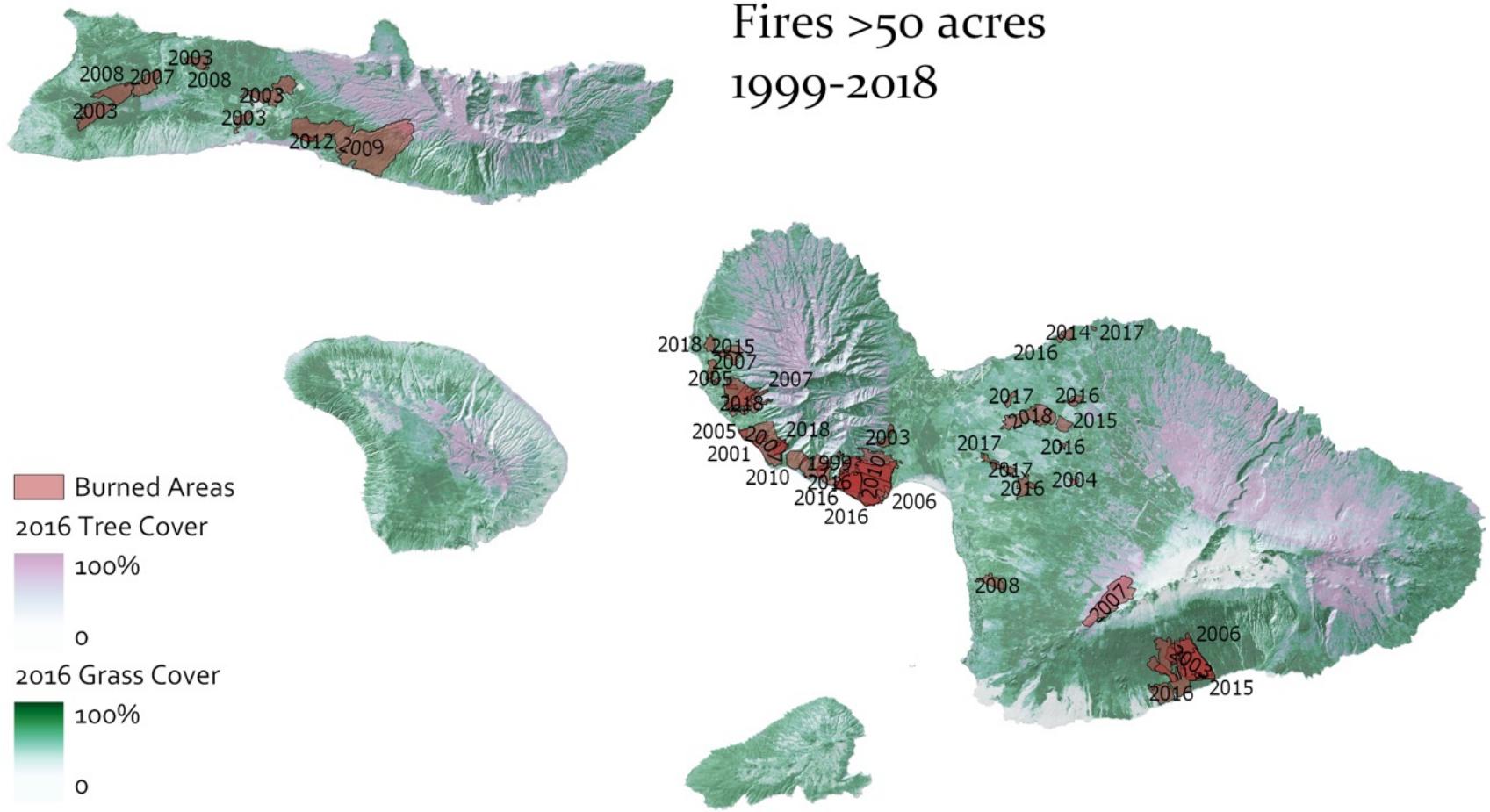
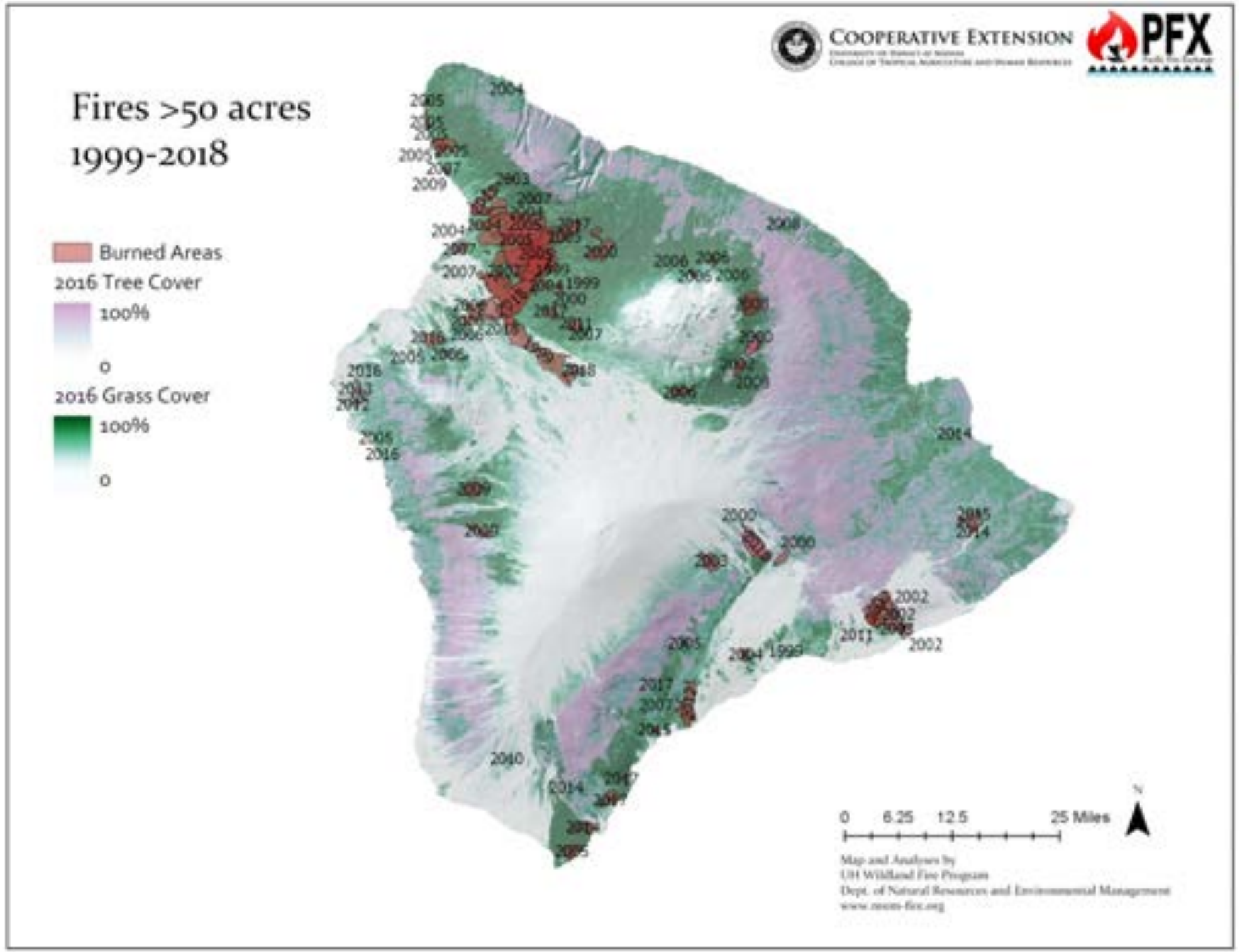
PFX Pacific Fire Exchange

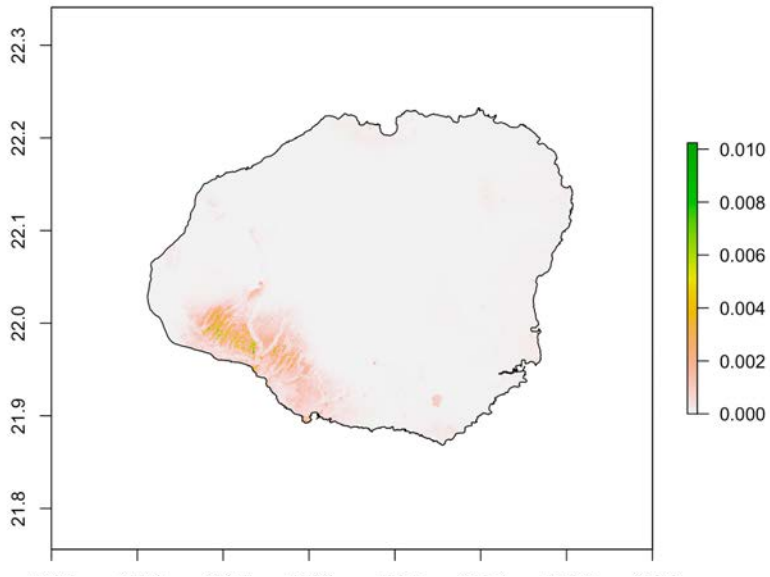
Fires >50 acres
1999-2018



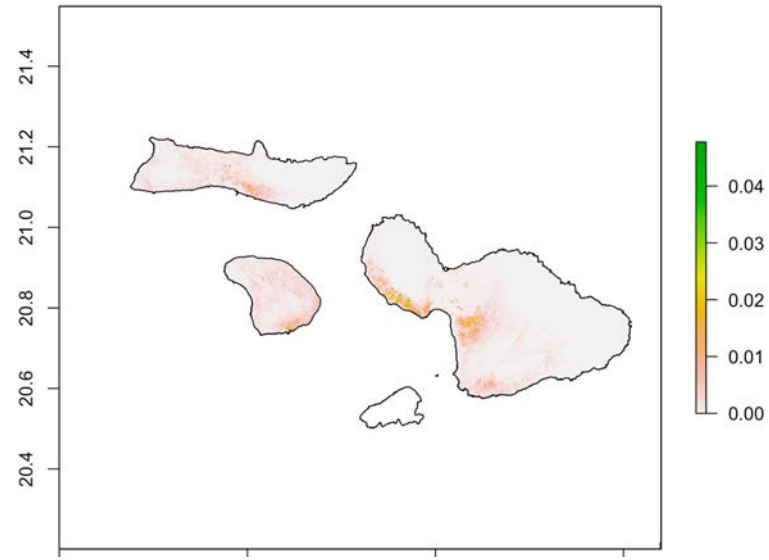
Map and Analyses by
UH Wildland Fire Program
Dept. of Natural Resources and Environmental Management
www.nrem-fire.org


Cooperative Extension
PFX
Fires >50 acres
1999-2018
Burned Areas
2016 Tree Cover
100%
0
2016 Grass Cover
100%
0
0 6.25 12.5 25 Miles
N
Map and Analyses by
UH Wildland Fire Program
Dept. of Natural Resources and Environmental Management

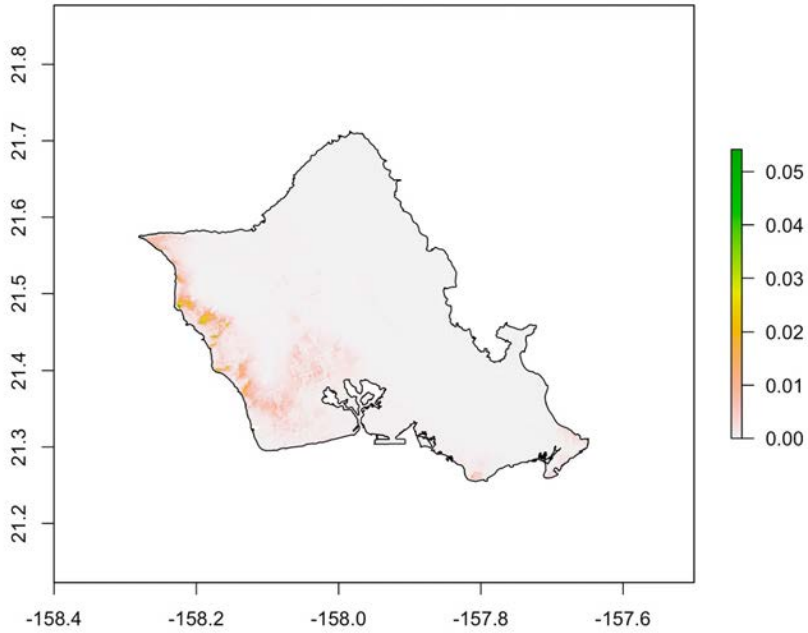
Annual fire probability Kauai



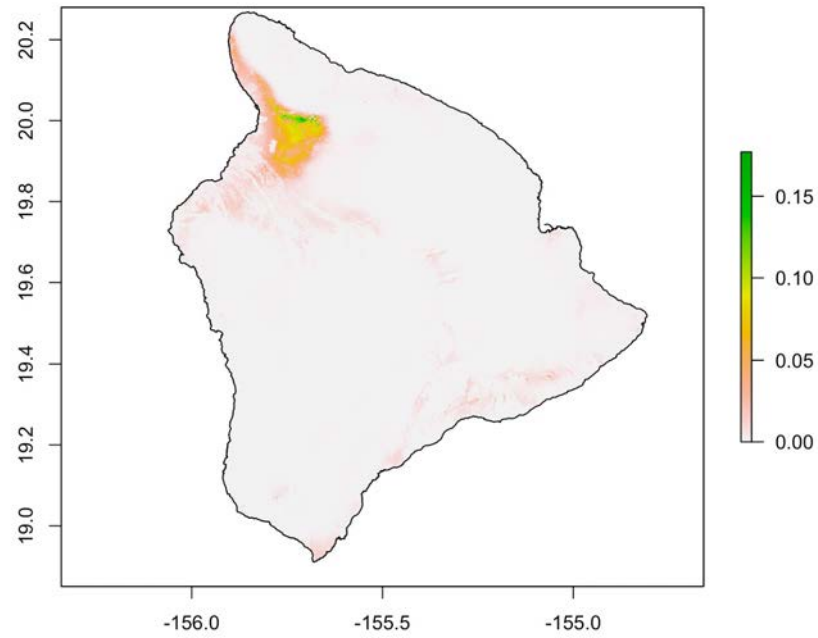
Annual fire probability Maui Nui



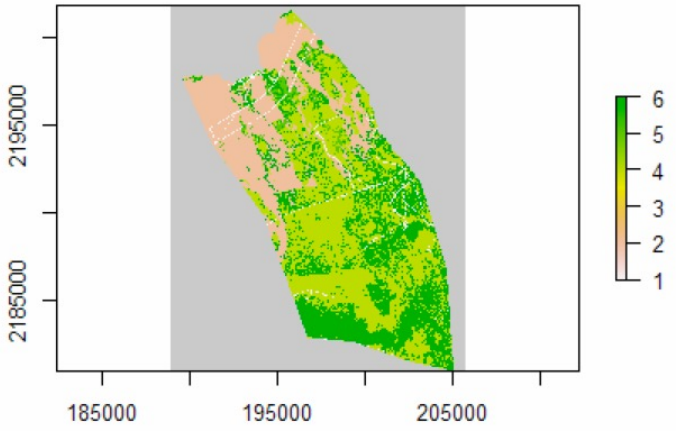
Annual fire probability Oahu

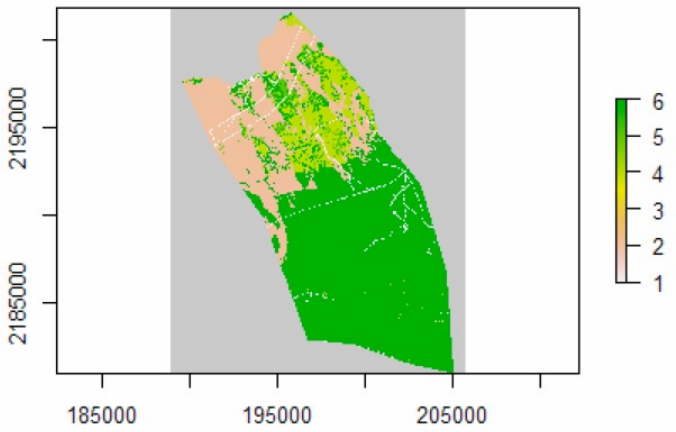


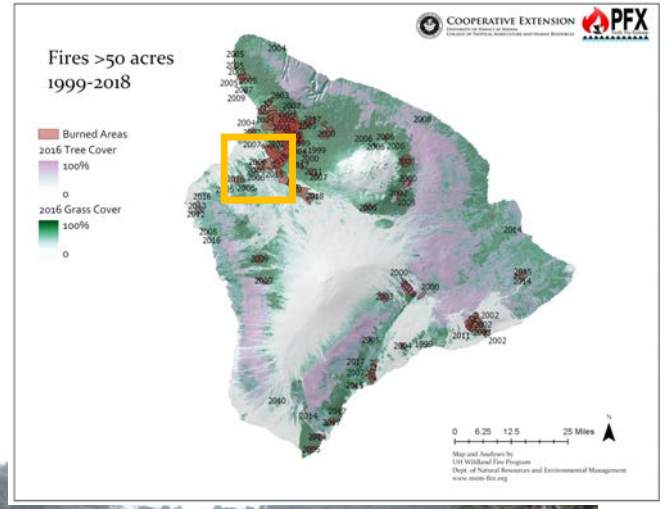
Annual fire probability Big Island



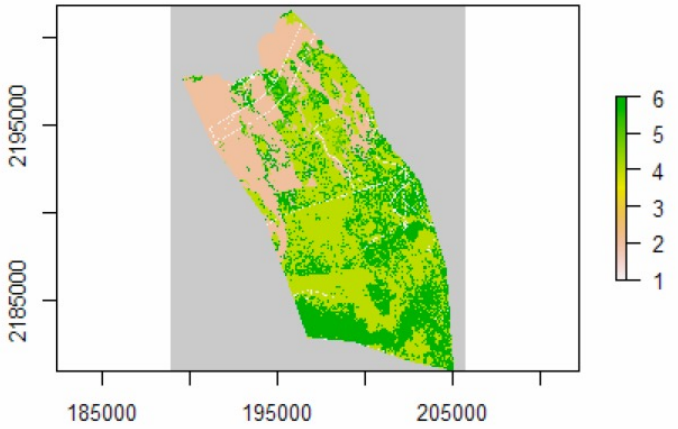
Fire-resilient landscapes

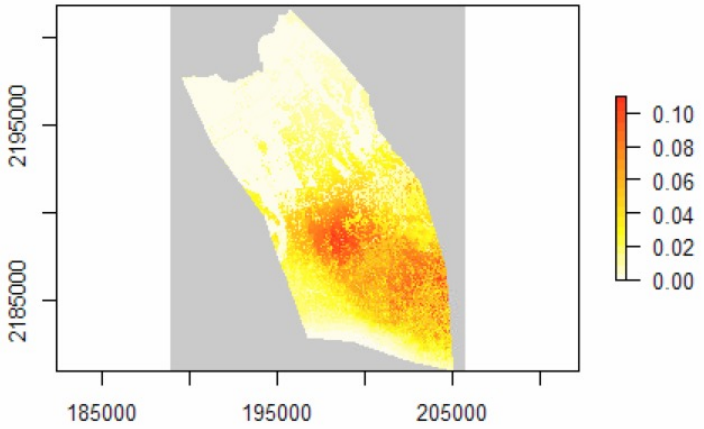




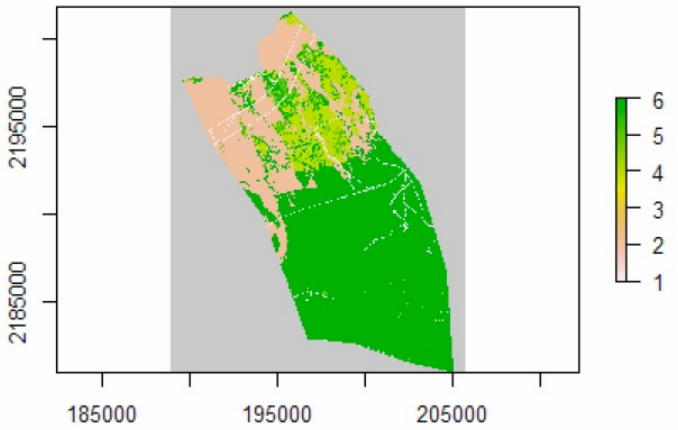


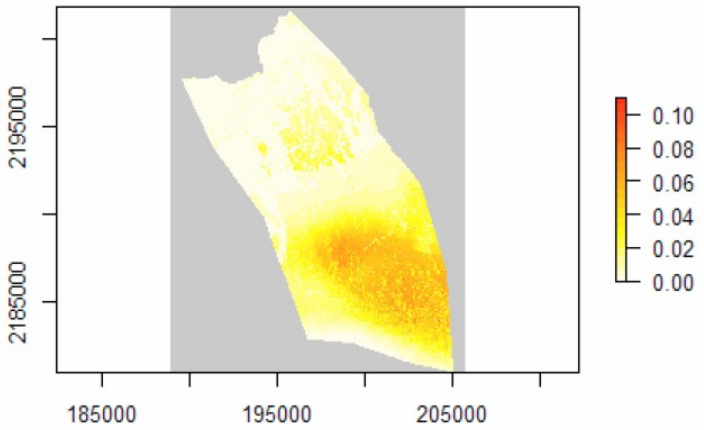
Fire-resilient landscapes





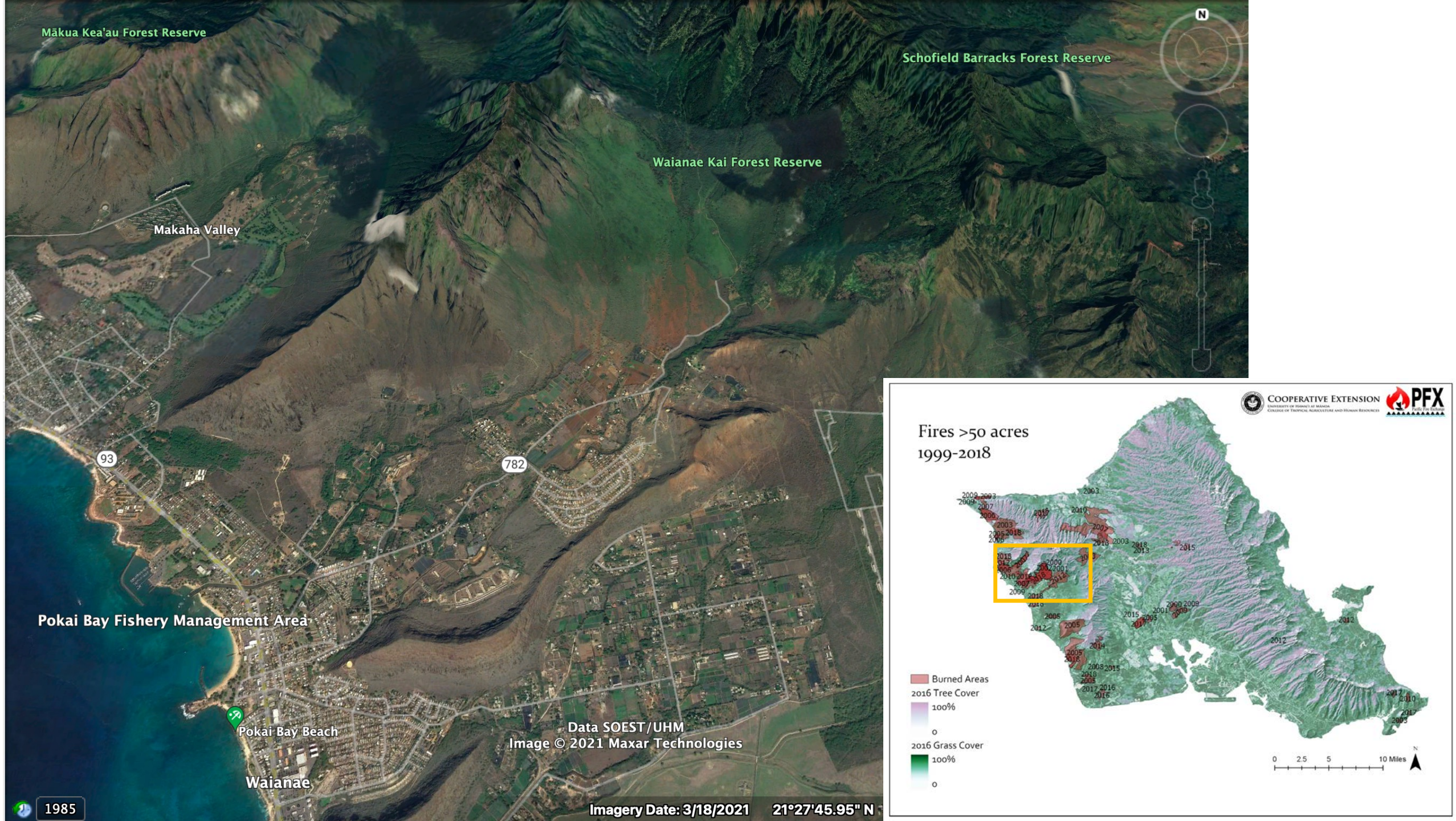
FUTURE CLIMATE,
NO RESTORATION





FUTURE CLIMATE,
FULL RESTORATION

Wada et al. 2017. Pacific Science

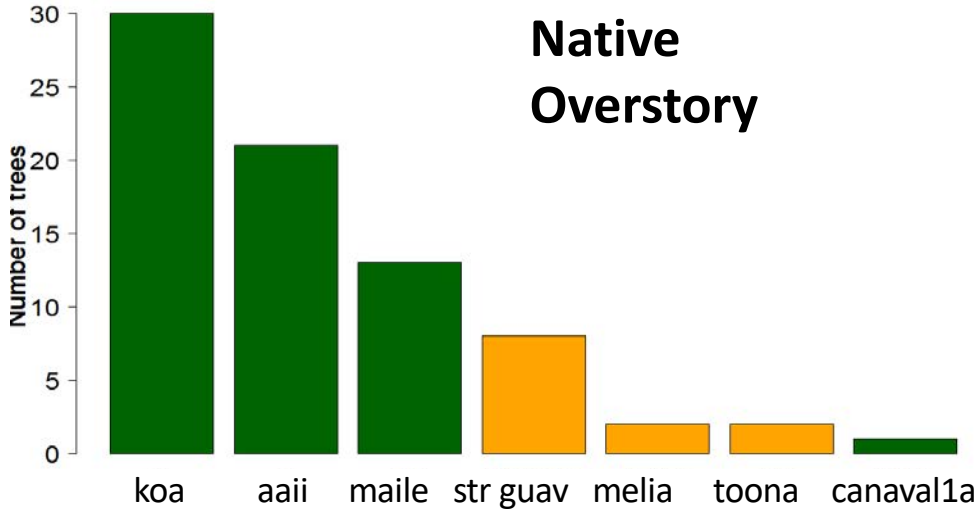

Mākua Kea'au Forest Reserve
Schofield Barracks Forest Reserve
Waianae Kai Forest Reserve
Makaha Valley
93
782
Pokai Bay Fishery Management Area
Pokai Bay Beach
Waianae
Data SOEST/UHM
Image © 2021 Maxar Technologies
1985
Imagery Date: 3/18/2021
21°27'45.95" N
N
Fires >50 acres
1999-2018
Cooperative Extension
PFX
Burned Areas
2016 Tree Cover
100%
0
2016 Grass Cover
100%
0
0 2.5 5 10 Miles

2004

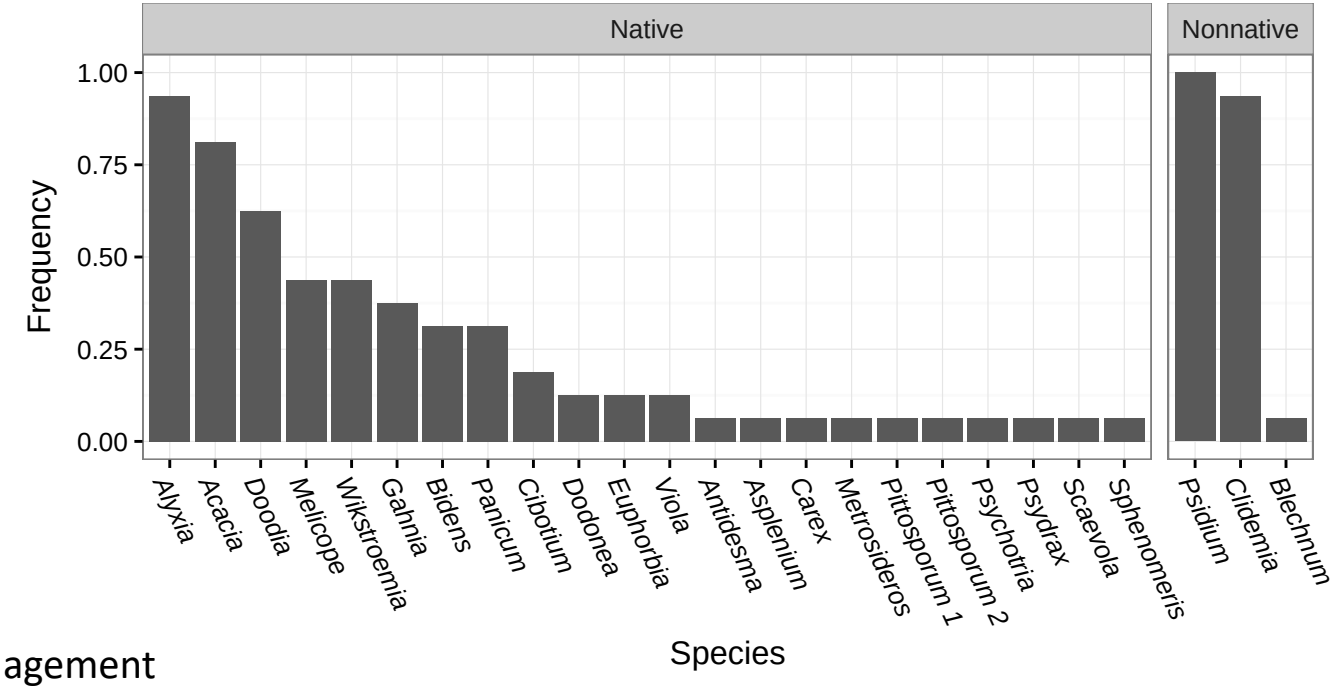
2017

‘Common’ species matter! Population trajectories and community composition

Burned, restored forest

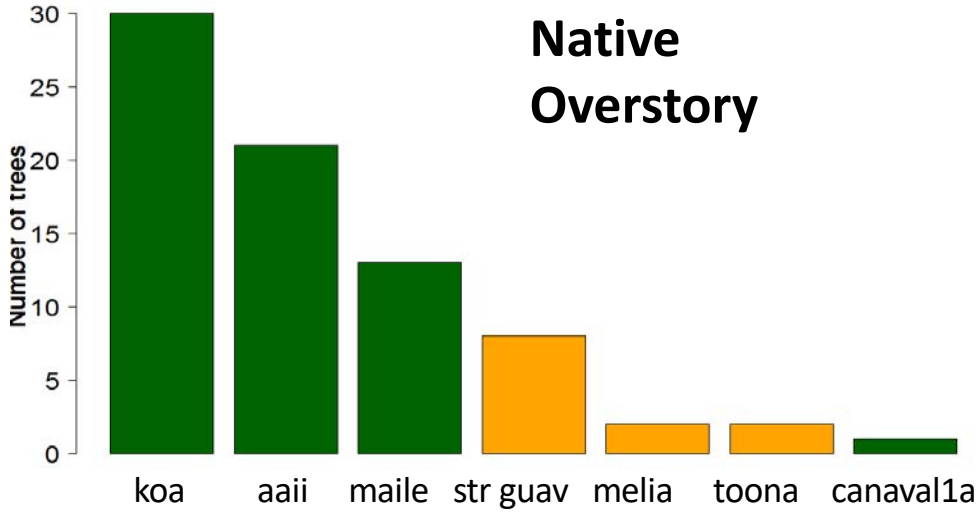


Adjacent, unburned forest

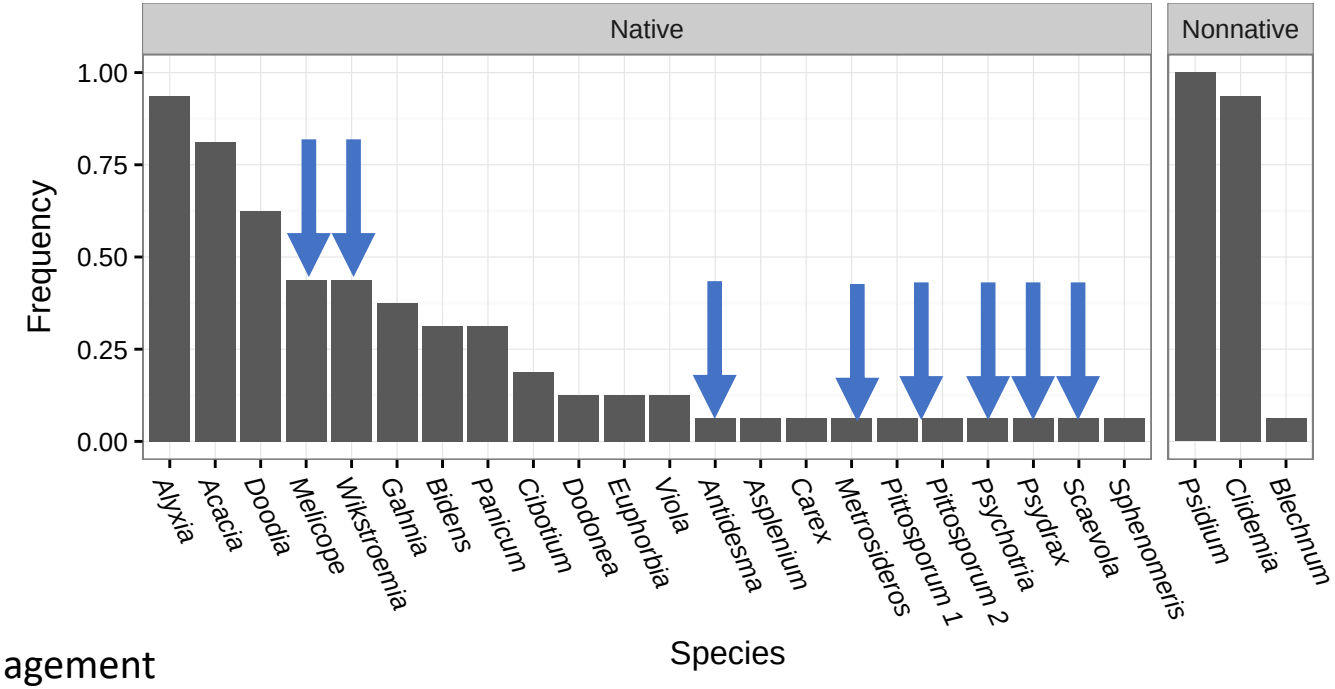


Trauernicht *et al.* 2018.
Forest Ecology and Management

Burned, restored forest



Adjacent, unburned forest



Trauernicht *et al.* 2018.
Forest Ecology and Management

<u>Common/Matrix Species</u>
Successional patterns
Growth/Survival
Reproduction/Seed ecology

Fire-adapted communities

HWMO
HAWAII WILDFIRE MANAGEMENT ORGANIZATION

HawaiiWildfire.org

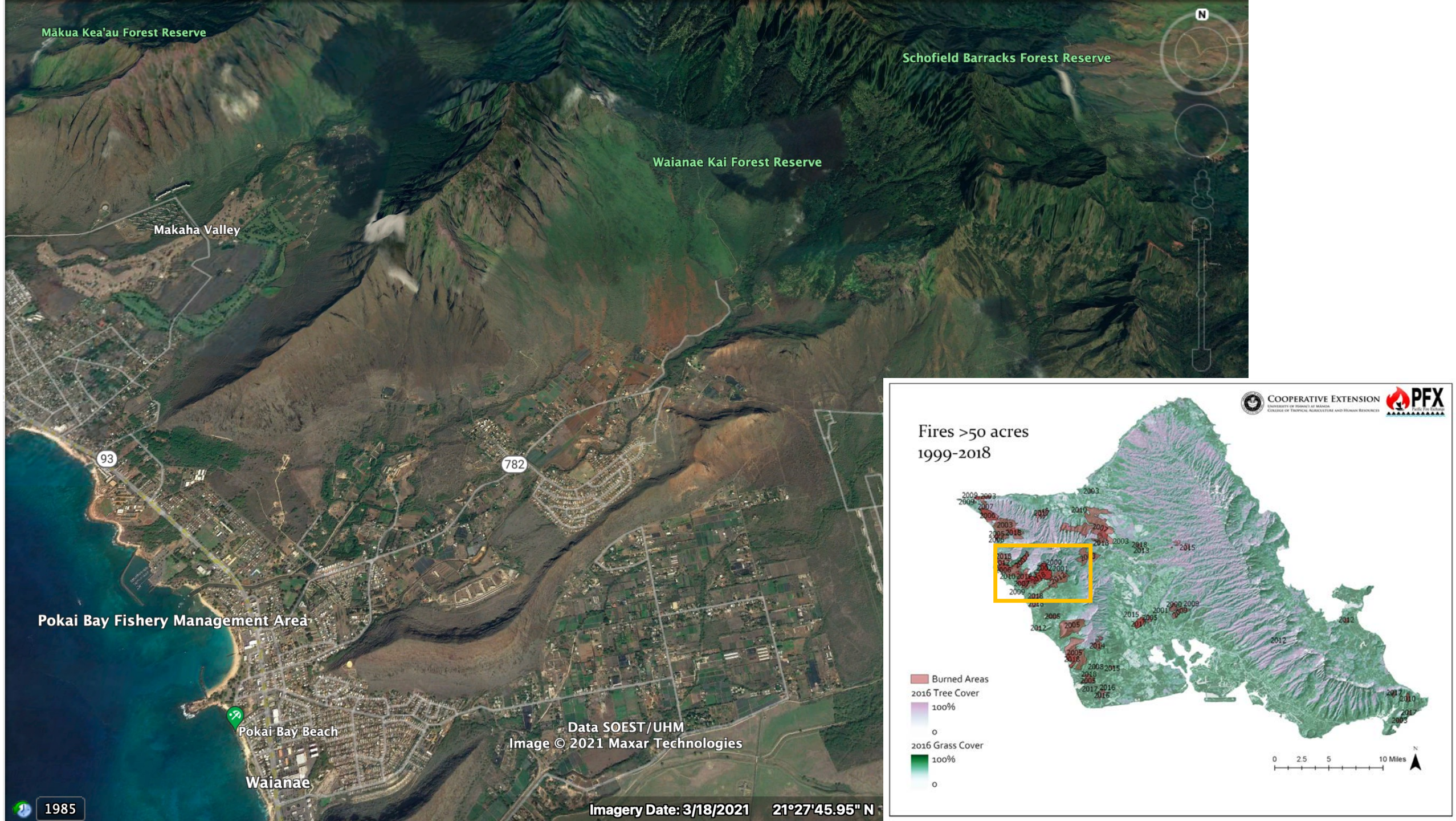
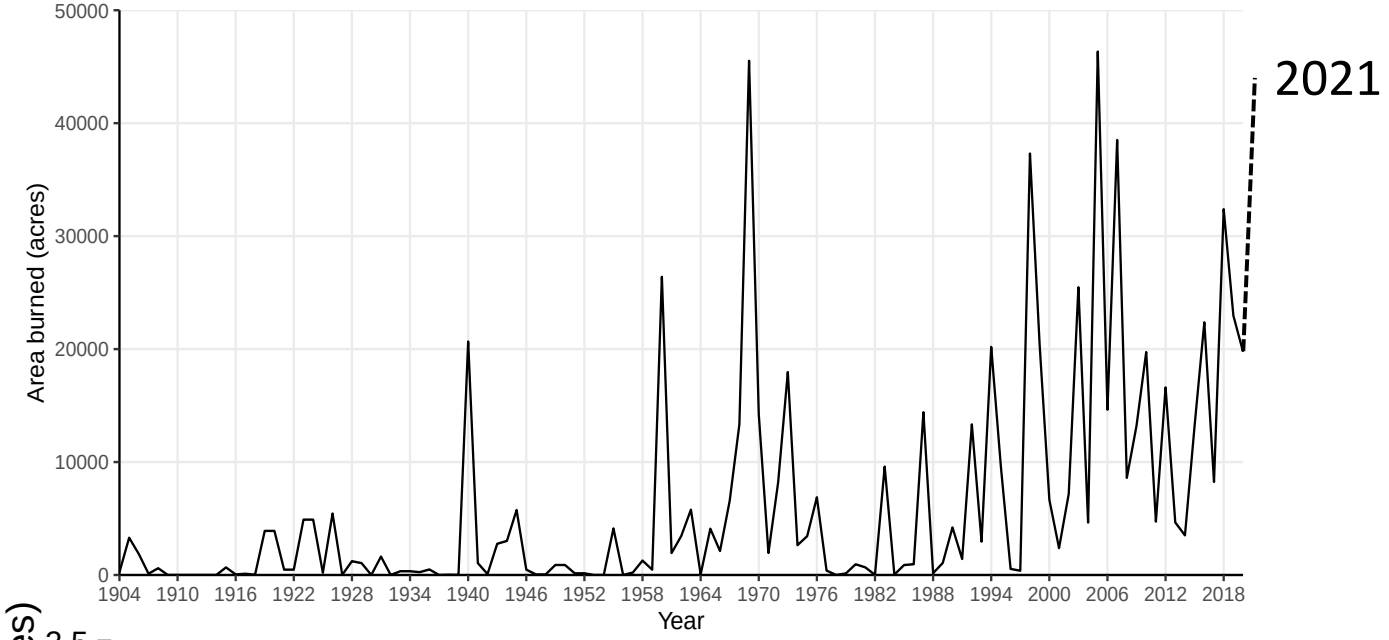

Mākua Kea'au Forest Reserve
Schofield Barracks Forest Reserve
Waianae Kai Forest Reserve
Makaha Valley
93
782
Pokai Bay Fishery Management Area
Pokai Bay Beach
Waianae
Data SOEST/UHM
Image © 2021 Maxar Technologies
1985
Imagery Date: 3/18/2021
21°27'45.95" N
N
Fires >50 acres
1999-2018
Cooperative Extension
PFX
Burned Areas
2016 Tree Cover
100%
0
2016 Grass Cover
100%
0
0 2.5 5 10 Miles

Photo: Ryan Peralta

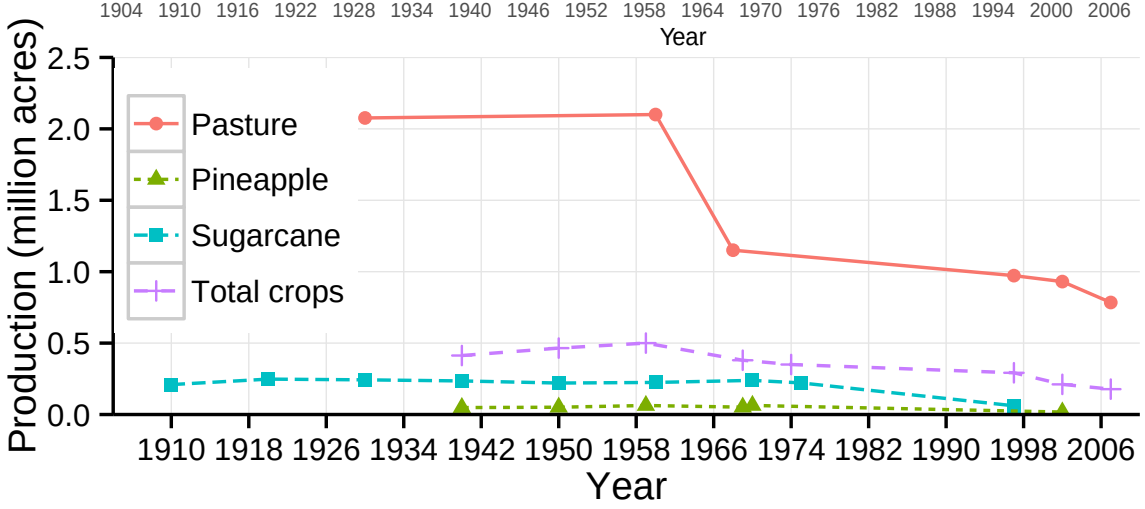
Invaded? Degraded?

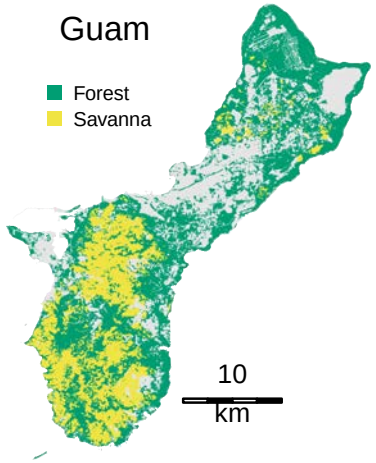
Hawaii Fire History and Agricultural Decline

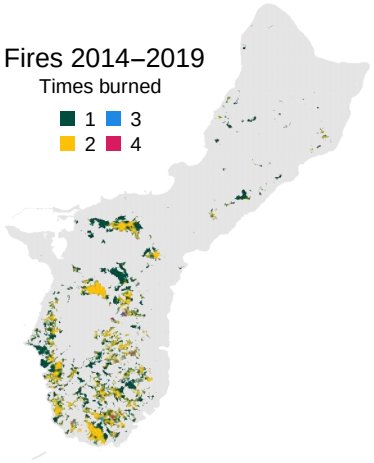
Annual area burned in Hawai‘i 1904-2021

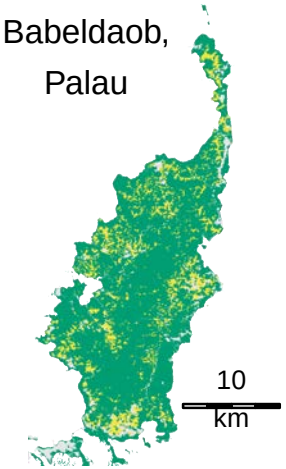


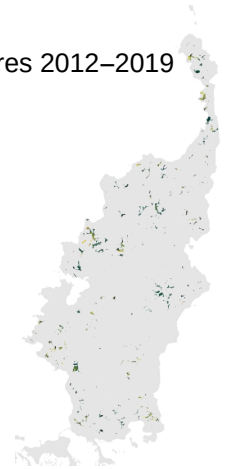
Land area in agricultural production in Hawai‘i 1910-2006

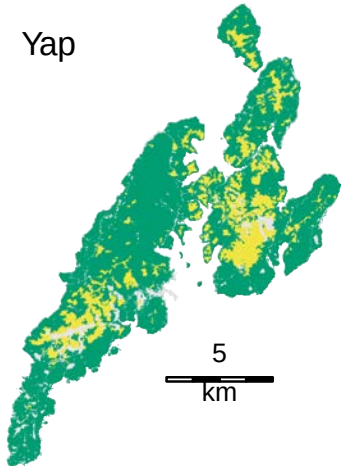


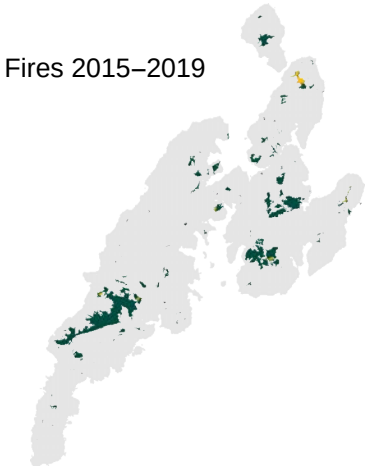

Guam
Forest
Savanna
10
km

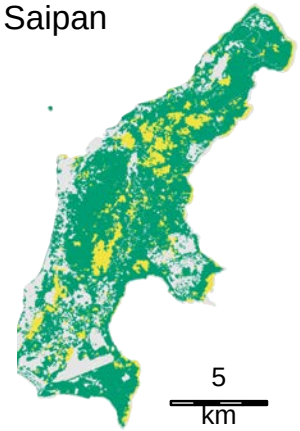

Fires 2014–2019
Times burned
1
2
3
4

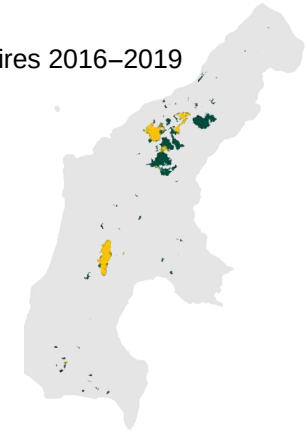

Babeldaob,
Palau
10
km

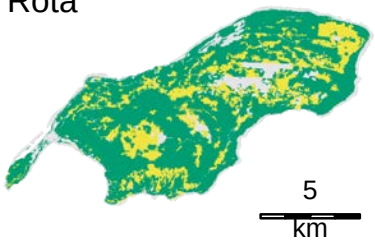

Fires 2012–2019

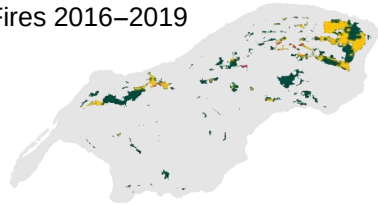

Yap
5
km

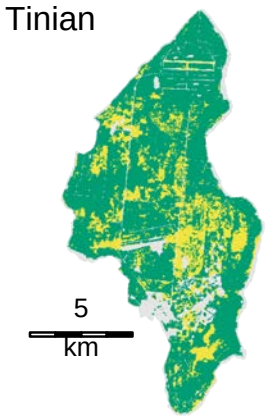

Fires 2015–2019

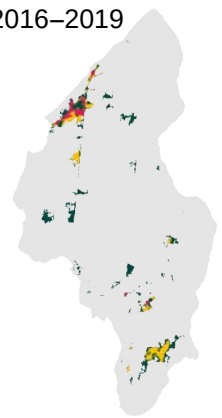

Saipan
5
km


Fires 2016–2019


Rota
5
km


Fires 2016–2019


Tinian
5
km


Fires 2016–2019

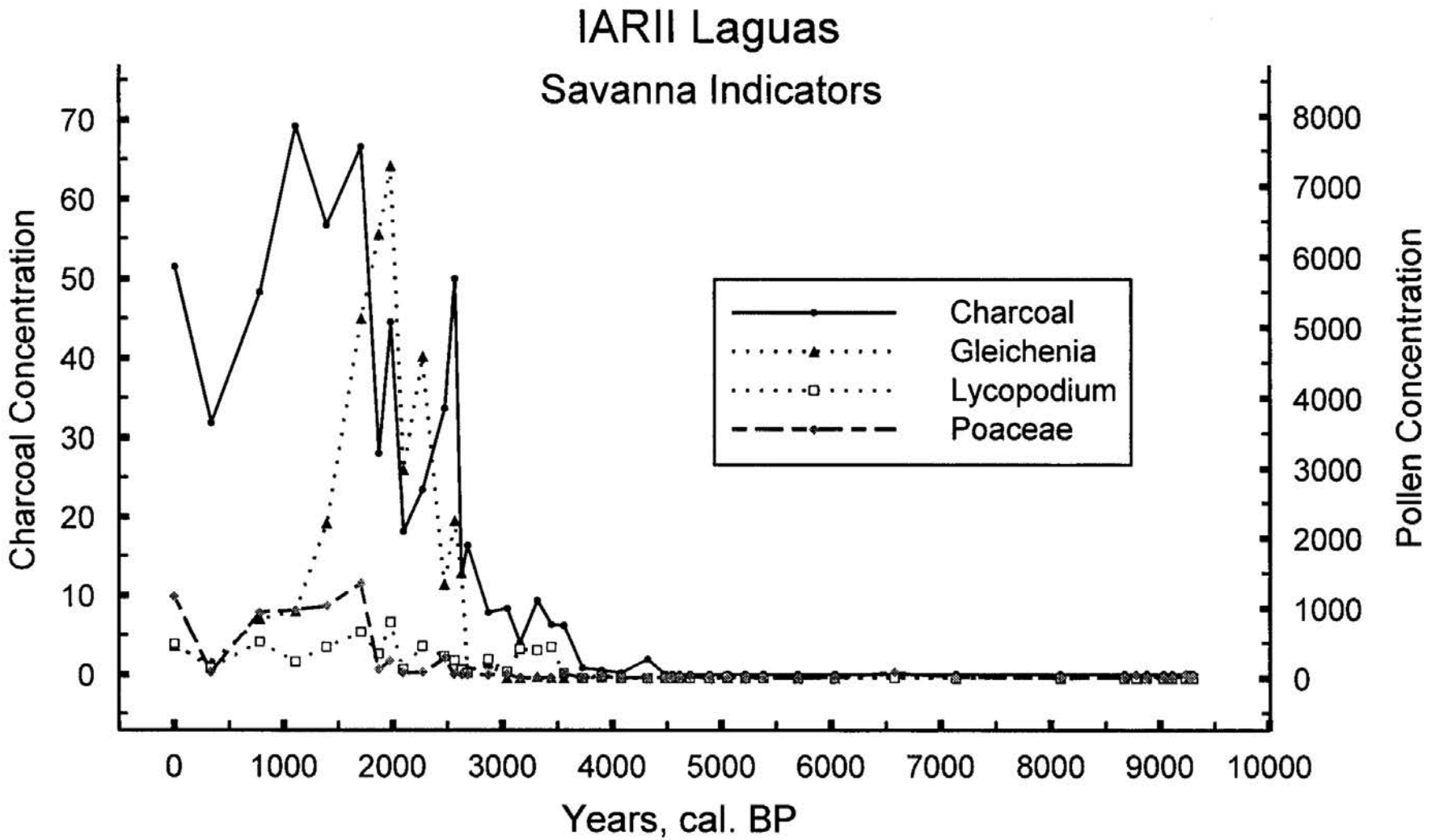


Fig. 7. Graph of charcoal particle concentrations and pollen concentrations of main savanna indicators for IARII Laguas core.

Athens, J.S. and Ward, J.V., 2004. Holocene vegetation, savanna origins and human settlement of Guam. *Records-Australian Museum*, pp.15-30.

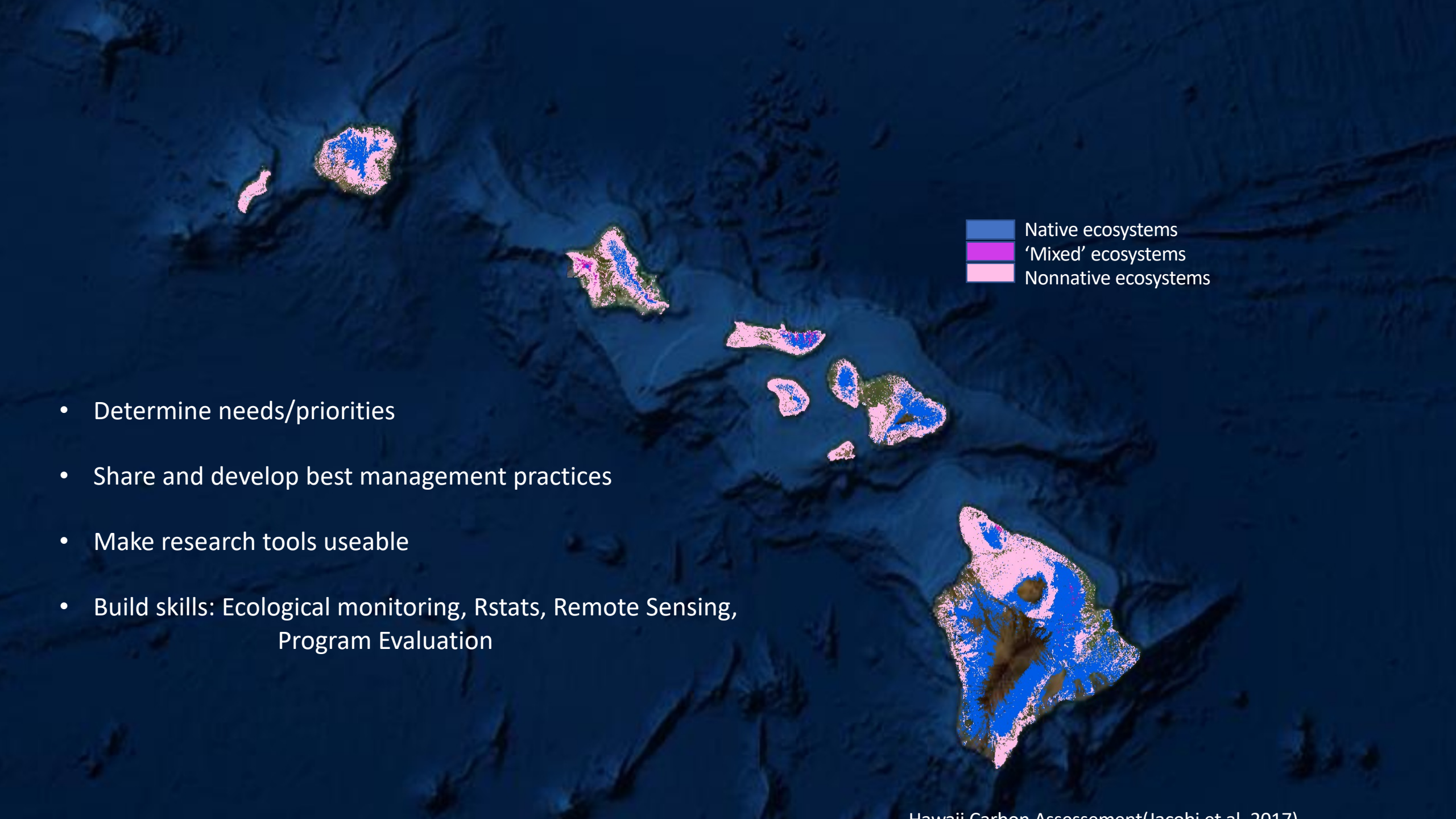

Kea‘au, O‘ahu August 2018

Building an NREM Extension program for conservation and restoration

Building an NREM Extension program for conservation and restoration

(helping people help ecosystems)

BIG UPS to ANRPO!



- Determine needs/priorities
- Share and develop best management practices
- Make research tools useable
- Build skills: Ecological monitoring, Rstats, Remote Sensing, Program Evaluation

Hawaii Carbon Assessment(Jacobi et al. 2017)

Mahalo!

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COOPERATIVE EXTENSION
UNIVERSITY OF HAWAI'I AT MĀNOA
COLLEGE OF TROPICAL AGRICULTURE AND HUMAN RESOURCES